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THE SCIENTIFIC BASIS OF MORALITY

BY

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The Great Laws of Science are the Chief Guides of Life

When all is known, and all is understood,
Mankind will see, whatever is, is good.

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PREFACE

THE object of the present book is to place the subject of human conduct upon a comprehensive scientific basis, and supply a rational want. About the year 1880 the author published a small book, entitled "The Scientific Basis of National Progress, including that of Morality." That book has long been out of print, and having been repeatedly advised to write a more complete statement of the relations of science to morality, etc., he has endeavoured to do so. Further, the time has arrived when a book on the subject is much required; many books have been written by able persons on the relations of science to sociology, religion, and theology, but none appear to contain a consistent scientific statement of those relations. According to H. Drummond: "The scientific demand of the age"—"is that all that concerns life and conduct shall be placed upon a scientific basis" ("Natural Law in the Spiritual World," 1888, p. 23). "The Christian world wants to be scientific" (Aubrey L. Moore, "Science and the Faith," 1889, p. 2). "Attempts of a high order are being made to find a scientific basis of ethics" (M. Kaufmann, "Socialism and Modern Thought," 1895, p. 8). "The missing science is a science of human character" (W. H. Mallock, "Social Equality," 1882, p. 101). "We want a system of morals better than any of those which are current amongst us . . . which shall be based upon the ultimate grounds of philosophy" (F. P. Cobbe, "The Theory of Morals," preface, p. v).

The chief subject of this book, and the main idea pervading it, are expressed in its title. Its leading object is to show, in a general way, that the entire conduct of man—physical, mental, and moral—is based upon a scientific foundation; to make clear the truth that the great powers and laws of science are the chief guides of life; to show that universal energy acting according to law is the true "divine" power governing physical, moral, social, and religious conduct; and to illustrate the influence of science upon the material, mental, and moral progress of mankind.

The book is largely one for the future; it is not a polished literary treatise, but a scientific production; it treats only of a small proportion of the relations of science to man; to treat of them all would be an endless undertaking. In it the energies of Nature are viewed as being the causes and regulators of all things; as determining the existence of man, the rate of human progress and of civilisation, and the rise and fall of nations, sects and families; as fixing the duration of human life, the limits of human ability, of man's mental and physical powers, and of his "freedom of will";

as forming the basis of human consciousness, of mind, and of the chief rules of physical and moral conduct; as being the causes of knowledge and ignorance, good and "evil," morality and "immorality," pleasure and pain, happiness and unhappiness, reward and punishment, wealth and poverty, economy and waste; as being the origin of competition, and intimately related to justice, truthfulness, and honesty; and to man's powers of self-discipline, self-regulation, choice and selection, his material prosperity, etc. How far these statements are proved to be true by the contents of the book is left to the opinion of the reader.

It has been generally assumed by theologians, moralists, and others, that science relates only to "base material substances," that it is not directly connected with morality, that it can throw no light upon various questions which deeply interest mankind, such as that of the existence of the human mind or soul separate from the body, a future state of life, the existence of a personal anthropomorphic ruler of the universe, the nature of "free-will," etc.; it is also commonly believed that moral phenomena cannot be scientifically investigated; according to W. H. Mallock, "the world of morals is as distinct from the world of science as a wine is from the cup which holds it" ("Is Life Worth Living?" 1882, p. 210); "Science, taken by itself, can supply man with no basis of religion" (*ibid.*, "Who's Who?" 1899, p. 649). Partly from prejudice, partly from the abstrusity and complexity of the subject, but chiefly from an erroneous belief that science cannot throw light upon moral or religious questions, scarcely any persons have properly investigated the fundamental relations of morality to the great truths of science, especially that of causation, and the doctrine is still extensively taught that certain mental phenomena are "supernatural" or "ultra-rational." In consequence of this, the political and spiritual leaders of men, not adequately perceiving the universal dependence of all human actions upon the great energies and laws of science, go on pottering with the great social evils which afflict mankind, adopting palliative measures whilst neglecting the more comprehensive preventive ones which a knowledge and study of science would suggest. All these questions are considered in the book.

Another chief object of this book is to show that all human progress is due to natural causes; that it has its origin in *new* knowledge; that maintenance of the existing state of civilisation is due to education and the constant diffusion of knowledge; that the rate of progress is regulated by the continual conflict of ignorance and intelligence, and that this conflict is itself due to natural causes. It has been remarked that "science has not attempted to explain social progress"; that there is "no science of human society"; that we have no real knowledge of the principles of progress or of evolution; that "science has yet obtained no real grasp of the laws underlying the development which is proceeding in society"; that "human evolution is not primarily intellectual"; "that since man became a social creature the expansion of his intellect has become a subordinate phase in the development in progress"; that science is "without any clear

faith of its own," etc. (B. Kidd, "Social Evolution," 1895, pp. 1, 2, 3, 6, 22, 24, 261, 263, etc.). How far these statements are correct may be judged of by the general contents of this book. As it has been still further asserted that "*a rational religion is a scientific impossibility*" (*ibid.*, p. 109), and lest it may be supposed that science is unable to reply to this affirmation, and that it has nothing to offer mankind as a worthy object to love, worship, and adore, some remarks are made upon this subject for the consideration of "ministers of truth."

Various sociological writers have lately complained that science does not help them; but this is largely because very few of them have attempted to apply its fundamental truths and principles, except that of evolution, to the subject, and because the phenomena of sociology are very complex. One literary writer has spoken of existing science as a "heap of vague empirical observations, too flimsy to be useful." On the other hand, Mr. Crozier, in his book on "Civilisation and Progress," p. 440, says:—"Science, by diving into the deep elements of the problem—material and social—and ascertaining the physical and spiritual laws on which it depends, will, by again enabling us to equalise the conditions, prepare the way for a new and higher social régime than any that history has yet recorded." H. Drummond also states:—"It is impossible to believe that the amazing succession of revelations in the domain of Nature during the last few centuries, at which the world has all but grown tired of wondering, are to yield nothing for the higher life" ("Natural Law in the Spiritual World," 1888, p. 32).

As the whole of human actions and conduct, both physical and mental, are manifestly governed by natural energy, and dependent upon scientific laws and conditions, there are introduced into the book, partly as illustrations, brief descriptions of a considerable number of phenomena which are not usually considered by unscientific persons as bearing upon the subject, but which really do so, either directly or indirectly. And whilst no one can reasonably expect to be able to read a scientific book with much profit without previously knowing the meanings of ordinary scientific terms, the subject is treated in as simple a manner as possible in order to assist unscientific persons. The whole of the book is written in the spirit that "God is Truth," and that obedience to Truth in accordance with the requirements of universal energy comes before all other considerations; and the entire book may be regarded as a plea for greater ideas, for truth, and obedience to law.

As it is impossible to remove very firmly fixed ideas from the human brain, and it is useless to attempt to convince by means of scientific evidence and arguments persons who hold indelible unproved ideas, this book is not written for such persons, but for those whose minds are in a fit condition to receive scientific truth. As also mankind are much more influenced by personal feeling and sentiment than by demonstration or argument, it may be expected that however perfectly the chief statements contained in this book are proved, the effects of them will only appear very

slowly. This quite agrees with the great scientific fact that every action and effect requires time, that the mental inertia of a nation is vastly greater than that of a few individuals, that great alterations in the ideas of mankind require a long time to develop, that the rate of progress of civilisation is determined for us and through us, and that before a new set of ideas can become universal the older portion of the present generation, with its fixed unprovable ideas, must die out.

Owing to several circumstances very considerable difficulties have been experienced in writing the book. 1st, The subject of it is very comprehensive, consequently the treatment of it is incomplete. 2nd, It is written in some respects in advance of its time, before scientific knowledge is sufficiently general, and before the great bulk of mankind are in a condition to fully understand it. 3rd, Various of the questions considered in it are very complex and profound, and include some which have been considered insoluble. And 4th, Some of the terms necessarily employed in it are still very vague and without definite limits of meaning; thus, the term *good* may either be limited to mean that which gives pleasure to sentient creatures, or be extended to all actions of all things; and *evil* may be either considered in the true scientific sense to be non-existent, or be restricted to mean only that which produces pain or discomfort in sentient beings. It has not been found practicable to explain on every occasion whether the term employed was used in its ordinary or in its scientific sense, and the kind indulgence of the reader in such cases is asked for. Usually, the scientific meaning is intended; for instance, all things are "good" whether attended by pain or not; and "life" means the phenomena of plants and animals only. That the same general ideas, and especially those which are important, unusual, or heterodox, are reiterated in modified forms in different parts of this book, is a consequence of their being necessary either to explain or illustrate different parts of the subject; "by iteration only can alien conceptions be forced upon reluctant minds" (H. Spencer). As some parts of the subject are impossible to be made very clear in the present state of general knowledge, and to wait for perfection is also impossible, the least objectionable course is to publish the book in its present state, and trust to the fair consideration of its readers.

The entire book is but a sketch of the outlines of a great subject, the less prominent portions of which require filling in; and the contents of it are respectfully submitted for the consideration of those who are competent to investigate the matter. Those who are opposed to the views set forth in it, or who consider that the subjects are treated too briefly, would much more readily excuse the brevity of the treatment if they only knew the great amount of evidence which has been omitted in order to limit the size of the book. The summary of conclusions at the end may be considered as an abstract of the book. Throughout the aim has been: "To tell the truth, and nothing but the truth."

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CORRECTION

Page 97, ten lines from bottom, should read—"compounds of alcohols" (see page 356), instead of "alcohols."

THE SCIENTIFIC BASIS OF MORALITY

"To the solid ground of nature trusts the mind that builds for aye."
—*Wordsworth.*

1. Explanation of Terms.

In order that the reader may be better able to comprehend the contents of this book, it is desirable to state at the outset the meanings attached to several general terms which are employed in it, such as fact, law, science, art, discovery, invention, truth, knowledge, etc.

Facts are truths; they are the foundation of all knowledge, and even mathematical formulæ must be made to agree with them. A law or principle is an abstract general truth, which has to be learned; a rule is an order or direction which has to be followed. Rules are based upon laws, and laws are based upon facts; thus we have the facts and laws of science, and the rules of art and conduct founded upon them. A law usually includes many facts; laws and principles are exemplified by facts. A general law or truth is arrived at by detecting a constant or uniformity amongst variables.

A science consists of facts and law which have to be learned, and an art consists of rules and instructions which have to be followed. "A science teaches us to know, an art to do" (Archbishop Thomson, "Laws of Thought," 1875, p. 10). Art is frequently called science, but "Where art begins, science ends." Every art is founded upon science; thus we have the science of electricity and the arts of electric-lighting, electro-plating, etc., based upon it; the science of astronomy and the art of navigation dependent upon it; the laws of sound and the art of music. The art of music is also founded upon numbers; that of painting requires truthful knowledge of Nature and of the chemical properties of pigments and the chromatic relations of colours; that of sculpture needs some acquaintance with anatomy; even poetry is largely dependent upon extensive, varied, and accurate observation of Nature by all our senses. There does not appear to be any real supernatural basis of any of the arts. Facts, laws, experience, and inference, form the original source and foundation of all our knowledge, practice, and progress.

Science is orderly, co-ordinated, or systematised knowledge, and has

been termed "the quintessence of experience"; it is the interpretation of Nature. A principle is a fundamental truth or general statement usually including many smaller ones; "it is often an abstruse idea, and is employed as a basis of deductive inference. Without knowledge of principles, an art can only attain a certain degree of excellence, and then not further improve, or may even decline; but with science there appears to be scarcely any limit to advance, because new knowledge is continually being discovered. An hypothesis is a tentative idea or question, held until it can be either proved or disproved.

Many persons confound together discovery and invention, and an invention is not unfrequently called a "discovery," but there is a considerable difference between them. A discovery is a new truth of Nature not previously known; an invention is an application of previously known truths to some desired purpose; the former is usually more comprehensive and altruistic, the latter is more narrow and personal. In the practice of discovery we search for new truth knowing it to be good for all men, but irrespective of applying it to any special purpose; in that of invention, we specially seek to apply known truths to effect some desired object; the steam-engine, and bicycle are inventions, not discoveries.

According to these statements, rules are based upon laws and facts; arts are based upon sciences; and inventions are founded upon already known truths and new discoveries. In illustration of this we may safely affirm that the chief rules of morality and of human conduct are based upon the great scientific law of causation; and that every new scientific discovery implicitly contains the materials of future new inventions, and of improvements in human conduct. The fundamental rule of righteousness, that we should do unto others as we would have them do unto us under like circumstances, is evidently based upon the principle of causation, viz., that the same cause always produces the same effect under the same circumstances, for if it could not be depended upon in all cases, the rule based upon it could not be fully trusted. A good definition of truth is very important; the simplest and briefest is, perfect consistency with facts; that alone is true which is consistent with all known truths. Truth is one and indivisible; it is universal and pervades all science, and without it science could not exist; knowledge is that which is known and is true, and not necessarily that which is merely believed and may be only opinion. Beliefs may be either true or untrue.

Whilst the foregoing terms admit of sufficiently definite and fixed meanings, there are others, the ordinary significations of which are in a very high degree relative and vary with a number of circumstances, and this great variability of meaning often produces considerable obscurity and mental confusion. Thus the meanings of the terms good and evil are extremely variable and often depend upon the whole of the circumstances of the particular case; what is good to one man or under one set of circumstances is evil to another or under another set of circumstances; whilst in the most comprehensive aspect, "all things are good." The

term "conscience" is another very relative one of variable meaning, and differs not only in every different epoch, but more or less with every different nation, and with every different person. The term "justice" also may have quite an opposite meaning in a given case according as it is viewed in a less or in a more comprehensive aspect. That which is "moral" in the widest or scientific sense may be "immoral" in the ordinary or narrow meaning. By a "miracle" is meant something without a natural cause; but according to science there are no miracles. The scientific meanings of these and other terms are illustrated in subsequent pages of the book.

2. The Scope and Claims of Science.

There are limits to all things, and therefore to the domain of science and of a scientific subject. "Experience concludeth nothing universally" (Hobbes); directly, by its own action, it does not, but indirectly, with the help of the intellect, it does in various important cases. Science and human power, like everything else, are limited by the possible, by agreement with the operations of energy, with law, and by consistency with all truth; by time, space, and all other natural conditions; but not by any "supernatural" ones, (see section 4). The man of science claims the power, and the right, to investigate all questions, of which his mind and other faculties are capable, and thereby to do the greatest good he can to all living creatures. All that science can do, that it will do without fear or favour, given the time and the other necessary conditions. Science is very much more comprehensive than it is usually considered to be; the whole universe is its province—it is the be-all, and end-all, of all real existences and of all their relations. "Every subject of interest, every object of wonder, every obscure analogy, every strange intimation of likeness in the midst of difference—the whole external and the whole internal world—is the province and property of him who asks to see and to understand the unity of Nature. It is a thought which may be pursued in every calling—in the busiest hours of an active life, and in the calmest moments of rest and reflection" (Argyll, "The Unity of Nature," 1884, Preface, p. vii). Science is cosmopolitan as well as national and individual. "Science alone can give us true conceptions of ourselves, and of the universe in so far as it is revealed to us—of our relations to the world around us, and to that infinite power beyond all seeing, on which all things visible depend. Science alone can save us from the conceit of the metaphysician and the theological gnostic, by demonstrating the limitation of the human intelligence, and its insignificance in the presence of the unsearchable reality" (*The Open Court*, No. 2, p. 271). Science is systematic knowledge; without the light of science, all is vague. We are indebted to the operations and influence of the great powers of Nature for all we have and are.

Science is universal truth, it affords us more or less information respecting all created things; it discloses to us the invisible energies which cause all natural phenomena; it describes those phenomena; it makes known to us the great laws and principles according to which they occur; it affords true views respecting the mode of government of the universe and mankind, of the chief phenomena of life and death, and respecting the question of "immortality"—and as the phenomena of life and death are determined by natural energies acting in accordance with natural laws, science is able to afford reliable rational consolation in the hour of death, in place of the irrational and unsafe consolation supplied by unprovable beliefs. Immutable truth, omnipotent energy, omniscient knowledge and wisdom, perfect morality and goodness, constitute a rational scientific object of religious veneration and worship.

The chief quality of real science is its high degree of certainty; this feature is most distinct in the simpler sciences, such as mathematics and astronomy, and is less apparent, though not less real, in the more complex ones of physiology, psychology, the concrete ones of geology, meteorology, and the applied ones of sociology, politics, and morality. The simpler sciences, including mechanics, astronomy, and large portions of physics and chemistry, afford a great contrast in this respect to theology, for whilst the former is based upon facts and laws, and proper and sufficient evidence, the latter is largely founded upon hypotheses or unproved beliefs. If the certainty of science is not really absolute, its degree of probability is often practically so.

The limits of science are virtually boundless, and include, not only the nature of man, the universe, the powers which govern them, the sciences of mechanics, heat, light, electricity, magnetism, chemical affinity, vital action, and that of the universal ether, but also the specially human subjects of morality, sociology, politics, statesmanship, and religion. Science treats of universal truth and consistency; omnipotent energy; infinite time and limitless space; the universality of system and order; the relations of all things to all things, and the dependence of all things upon all things; the genesis of all actions; the infinity of worlds; the universal principle of causation, the continuity of all phenomena; the evolution of worlds, and of all inanimate and animated things, including man, mind, universal history, the rise, decline, and disappearance of worlds, nations, tribes, and sects, moral, social, theological, and religious systems; the changes of all things throughout all time and space; the infinite variety and number of movements of worlds, of dead and living things, of masses, molecules and atoms; of the endless variety of vibrations of the universal ether which pervades all bodies and all space; of all the modes of energy, mechanical, chemical, vital, nervous, and mental; of all the properties of bodies, both animate and inanimate, and of all the phenomena of matter and of mind.

Science claims the powers of revelation and of prophecy; of revelation by discovering new truths by means of experimental, mathematical, logical,

and other modes of investigations, and of prophecy by means of mathematical and logical methods. This power of revelation has been abundantly proved by the numerous scientific discoveries and inventions in all directions which have already been made for the advantage of mankind, and which are but a feeble foretaste of the infinite variety and number of them yet to come. It claims the gift of prediction, the power of determining beforehand in suitable cases, the future consequences of present actions, the existence of unknown worlds in space and of unfound elementary substances which the eye of man has never seen nor his ear heard, and to pre-determine what their properties are. The power of prophecy has been copiously proved by the successful prediction of eclipses, the prevision of the existence of the planet Neptune, the metals Thallium, Gallium, Germanium, Scandium, the gases Argon and Helium, by means of spectrum-analysis, and numerous organic compounds, including a number of alcohols, etc., the whole of which have since been obtained and their properties determined and found to be substantially the same as those predicted. In proportion as the sciences become more perfect, so the power of successful prophecy in them increases; it is because astronomy is the most simple, the most essentially perfect and calculable of the sciences, that future events can be predicted in it with such a high degree of certainty. Science not only predicts and promises, but fulfils its predictions, and performs its promises. Science says:—given the entire present state of the universe, all the future states of the universe necessarily follow. All these results of the labours of the scientific investigator justify his title of "The High Priest of Truth." Science indicates even in its present extremely incomplete state, to some extent, the limits of the possible and of the impossible; it shows in suitable cases what cannot exist, as well as what must be. It prophesies the gradual extinction of numerous unprovable sectarian beliefs, and thereby the cessation of theological hatred, "religious wars," and "religious atrocities," and the ultimate triumph of demonstrable and verifiable truth.

Even the order of relative degrees of intrinsic importance of incommensurable things can, to some extent, be determined by aid of scientific rules or methods; for instance, knowledge is essentially of greater importance than money because it is more comprehensive; men might do without money, as they did in ancient times, the period of barter, but they could not do without knowledge; without the latter a man could not even find his way home nor perform scarcely any act with safety; truth exists independently of man, but money is only a human invention, an immense number of commercial transactions are carried on by the use of truth or knowledge in the form of cheques, bank-notes, and other promises to pay without employing actual money. The order of relative degrees of essential importance of various other incommensurables may be determined by the help of proper scientific ideas in a similar manner, (see section 69).

"Science dominates everything; it alone returns any final services. Not any man, nor any institution, henceforth shall have a lasting authority,

if it is not comformable to its teachings" (M. Berthelot, "Science et Morale," 1897, p. xii). Science is the art of correct thinking, its method is the same in all subjects, and its certainty consists in its method. It has been said that "the poet understands Nature better than the man of science," but this is not quite correct; thus, whilst the poet appreciates the more superficial, delicate, and finer changes of Nature, especially in their relation to human feeling and sentiment; the man of science far better understands the great powers upon which these depend, and the great laws in accordance with which they occur, and is gradually extending his knowledge of the profound relations of all things, visible and invisible, not only to mankind, but to all other things in the known range of space.

"For direct self-preservation, or the maintenance of life and health, the all-important knowledge is—Science; for that indirect self-preservation which we call gaining a livelihood, the knowledge of greatest value is—Science. For the direct discharge of parental functions, the proper guidance is to be found only in—Science. For that interpretation of national life, past and present, without which the citizen cannot rightly regulate his conduct, the indispensable key is—Science. Alike for the most perfect production and highest enjoyment of Art in all its forms, the needful preparation is still—Science. And for purposes of discipline—intellectual, moral, religious—the most efficient study is, once more—Science" (H. Spencer). Knowledge of science saves a man much expense, both of money, thought, and labour. Many persons, who are at present unwilling and unable to believe it, will find, in the course of a few years, that science is gradually becoming the middle and the end, the be-all, and the end-all, of human existence.

3. The Great Laws of Science are the Chief Guides of Life.

As the whole of the phenomena of human conduct treated of in this book essentially depend upon the fundamental laws, truths, and principles of science, especially the law of universal causation, it is necessary to make some preliminary statements regarding those laws and principles. The energies cause and govern, whilst the laws, principles, and general truths represent all natural phenomena. The great laws of Nature are not mere notions, but verifiable certainties; they are not causes, but abstract statements of facts and conditions; and some of them are, so far as we can infer, true throughout all time and all space. They are the chief guides of life, because all living and dead substances are subject to them, and man's only safety and protection from calamities lies in his knowledge of and obedience to them. The only infallible powers are not popes, emperors, or nations, but the energies of Nature, and the former are merely the puppets of the latter. The principles of causation, evolution, gravitation, internal molecular motion of substances, equivalence of cause and effect,

indestructibility of matter and energy, are universal and irresistible;—all men must obey them, and none can escape; no man ever succeeds in evading them. If we disregard the law of chemical union, and carry a lighted candle into a room filled with a mixture of coal gas and air, an explosion occurs, and we suffer more or less injury. If we pay no heed to the law of gravitation, and step over the edge of a precipice, we are either killed or injured. If we ignorantly neglect moral training, self-discipline, and the acquisition of knowledge and wisdom whilst we are young, we are usually punished severely when we are old, we become either bankrupts, profligates, criminals, or paupers; it is chiefly in consequence of self-neglect by parents of poor children that the criminal and destitute classes are produced. It makes very little difference to our punishment and suffering whether we disobey the laws of Nature wilfully, carelessly, or through ignorance; for instance, if we drink a solution of cyanide of potassium in mistake for water, we instantly die. Nature never forgives, nor omits to punish wrong conduct, she mercifully punishes in order to prevent evil-doing, and she inflicts pain in order to preserve life and compel improvement; there is no wheedling her by means of begging petitions. As scientific powers lie at the basis of all things, the phenomena of man, of empires, of worlds, and of the universe, are but consequences of the operation of those powers; the lapse of ages does not weaken them nor diminish the infinite variety of their effects or uses; all men may pass away, but great energies and laws remain; man is but a mere speck in the universe. The very existence of substances, with their conditions and actions, in a system of complete law and order, implies their necessity and justification, with continual liability to compulsory change in accordance with unceasing motion and the principles of continuity and evolution.

According to the views of some orthodox theologians, the laws of Nature are not inviolable. One writer affirms that "the laws of Nature are subordinated to miracles," and that "the world is governed supernaturally" (H. Bushnell, D.D., "Nature and the Supernatural," 1863, pp. 235, 280); and many theological authors make similar unprovable assertions. The late Cardinal Newman said, "One of the most remarkable instances of this fallacious impressiveness" (viz., that facts are not necessarily proportionate to the vividness of our impressions), "is the illusion which possesses the minds of able men, those especially who are exercised in physical investigations, in favour of the inviolability of the laws of Nature." To speak of the scientific belief in "the inviolability of the laws of Nature" as an "illusion," is quite sufficient to show a great deficiency of knowledge of science in the mind of the writer. Does the sun ever fail to rise? No one but a person ignorant of fundamental science would deny the invariable supremacy of scientific energy and natural laws over the existence and actions of mankind, or that the principles of science constitute a foundation for rules of human conduct; if the chief laws of science were not inviolable, scientific predictions would fail. It is only by obedience to those energies and laws, *i.e.*, by proper training and the acquisition of suitable knowledge by children,

that the sufferings of human beings can be largely prevented; all other plans are mere palliatives, and even the efficiency of this method is limited by the extreme smallness and feebleness of human powers and the imperfect state of civilisation. Until the moral teachers of mankind acquire knowledge of those laws, and of the dependence of morality upon them, there will be but little chance of any great amelioration of human misery. The application of those laws to explain human conduct gives us a true view of life. Many persons object that "the laws of science are not absolute," but why cavil about that, when the probability that they are true is often millions of millions to one; the human mind cannot comprehend "absolute" certainty.

It is well-known that nothing fortifies and pacifies the mind and preserves it from insanity like true philosophy; that the real philosopher, who bears the successes and ills of life with uniform calmness and resignation, is he who is familiar with sound fundamental principles, and obeys them. As the great laws and principles of science are the foundation of all real knowledge, and of all physical and moral conduct based upon it, if a man is not familiar with them, it matters not how much knowledge and experience of other subjects he may possess, his mind is unstable and defective at its very basis, he is without the greatest and safest guides of life, he is unable to secure the greatest peace and consolation, he sooner or later perceives the superficiality of his own conduct and the hollowness of that of men around him, and he finally concludes, in his old age, that "all is vanity and vexation of spirit." And if, instead of being a firm believer in the verified principles of science, he believes in unproved supernatural ideas, he sooner or later finds that by the extension of science and knowledge his fondest beliefs are proved to be false, and as (owing to the properties of the human brain), he is unable to get rid of them, his mind is torn by conflicting ideas which make him miserable, and he feels that his life has been largely a failure. The poet asks: "Can the stars give us peace?" and science replies, certainly they can, because they prove the universality, omnipotence, and immutability of energy and law, and the stability of the universe, and therefore the safety of man if he will but obey law and adapt himself to it. Science can, in suitable cases, tell us what is impossible as certainly as what is possible, and must be. For instance, it informs us that in all the thousands of relative positions of the sun, earth, and moon towards each other, an eclipse of the moon by the earth is impossible except in the one single case in which the three bodies are in a straight line with each other. In all true and complete explanations of human phenomena, whether physical, mental, moral, or theological, we must recognise the existence, and allow for the influence, of all the great energies and laws of Nature. To be learned in many languages, or to be highly cultured in small ideas, is but small compensation for ignorance of the great truths of science. In science lies the true "salvation of men."

Human companionship is very valuable, but familiar acquaintance with the great powers and principles which govern all things is much more so;

the fidelity and punctuality of men often fails, but that of natural laws never does; the wisdom afforded by a knowledge of great principles is far more comprehensive than that obtainable from ordinary advisers or confessors; the majority of human defects would be vastly diminished, if all men understood the great powers that govern them; the almost universal deficiency of charity of man towards his fellow-man is chiefly due to insufficient appreciation of the great fact that all the actions of men are determined and governed by universal energy.

Great laws, principles, and general truths, are the keys which open the chambers of mystery and superstition, and release the human mind from the bondage of uncertain, occult, and unprovable ideas. An extremely important result of the circumstance that the universe and mankind are governed by a perfect system of universal energies and laws is, that such a system must necessarily contain in itself the means of answering all possible rational questions respecting the universe and all that is in it, including man, his present and future conditions and conduct. In accordance with this we find that in direct proportion as we acquire ability to interpret those laws, we are enabled to adapt Nature to ourselves, to obtain answers and questions respecting bodies, animate and inanimate, their forms of energy, and actions; and to predict beforehand not only the periods of eclipses, and the existence of new metals, but also the consequences of our own acts, and thus to gradually advance in comfort, peace, prosperity, and happiness; and in this way a true millennium of universal virtue and peace is gradually being evolved. At present we have only experienced a slight foretaste of the blessings yet to come as a consequence of this inseparable and important property of a system of energies and laws. "Men will never realise to what height of power and happiness in the world they can grow, nor their responsibility for their growth, until they realise that they come into being by natural laws and by no other laws; that they feel and think and act always in virtue of natural laws and of no other laws; that in success and in failure, in health and in sickness, in folly and in wisdom, in life and in death, they are subject to natural laws and to no other laws" (Maudsley, "Natural Causes," etc., 1897, p. 311). Although many pious persons have found fault with, and pointed out apparent imperfections in the leading principles of science, very few have been able to suggest any great improvement in them. The only safe course in life is to have full confidence in the unlimited essential perfection of the universe in all its parts, and in the immutable system of truth which represents it.

As the subject of the foundations of science is so extremely important to mankind, especially as being the true basis of morality, it appears highly desirable that a special professorship entirely devoted to directly teaching and illustrating the chief principles of science should be established in every scientific college.

4. On Existence and Relation.

Of all the millions of millions of different bodies known to exist in the universe, every one must necessarily possess properties and relations, and if it did not we could not know of its existence, because it would not have any effect either directly or indirectly upon us, and we would not arrive at a knowledge of its existence by means of our reasoning powers. Each one possesses relations to time, space, motion, and to all known bodies, and not a single well-verified exception to these statements amongst all the vast number has ever been found; even time and space possess relations. Each substance, by its molecular motion, affects the universal ether, and through it all the other bodies in the universe, and as each different one affects the ether differently, so it influences all other bodies differently; thus a magnet, an electrified body, and a heated substance, act each differently upon all surrounding bodies, and, so far as we know, at all times and in all places. "Every individual object, organic or inorganic, is the product of two factors: first, the relation of its constituent molecules to each other; secondly, the relation of its substance to all surrounding objects" (G. H. Lewes, "The Physical Basis of Mind," 1877, p. 40; see also J. Bayma, "Molecular Mechanics," 1866). All things that exist have been produced by sufficient causes; and all physical realities exhibit phenomena.

"To know a thing is to know its relations; it *is* its relations" (G. H. Lewes, "Problems of Life and Mind," 1874, vol. i, p. 64). Properties and relations constitute our idea of existence; a thing without properties and relations to other things has no being; no substance can exist (or action occur) without being related to time, to space, and to all substances in the universe through the medium of the universal ether; take away all its properties and it ceases to be, but as matter and energy are indestructible we cannot take away all the properties of any real substance. Properties, however, are not ponderable entities but attributes of them, and many of our ideas of properties and qualities are abstractions. The terms, property, relation, and existence, are largely synonymous and together constitute "things in themselves." Properties and relations are the egos of all real existences. Things which have properties or relations are real, and all are false besides. The properties and relations of bodies are the "alphabet of Nature." "A thing without properties is an absurdity, neither imaginable in reason nor experienced in Nature" (Drossbach). The most intangible substance known is the universal ether, and that has the property of motion. All bodies agree in certain respects (Spinoza), for instance, in possessing weight and molecular motion. "It is to Philo Judaeus that we owe the doctrine that nothing can exist without certain properties" (Gall).

The properties and relations of substances are mutually dependent and inseparable; a substance without properties could have no relations, and one without relations would be destitute of properties; for instance—first,

if a substance has no relation to time it has no properties or existence, because all things require time in which to exist; second, if it has no relation to space it has no extension or direction of motion, and if it possesses no extension or motion it has no relation to space; third, if it has no relation to gravity it has no mass, and if it has no mass it has no relation to gravity; and fourth, if it has no relation to the universal ether it has no internal motion, no energy, and no life, and if it has no such motion or energy it has no relation to the ether, etc. All relation is mutual, if A has no properties it can have no relation to B, if B has no properties it has no relation to A; if A or B has no relations to other bodies it has no existence and cannot affect them. If there were living spirits in space they would impart motion to the ether, and through it to ponderable bodies, and directly or indirectly to ourselves. The existence of things which have neither properties nor relations can neither be proved nor verified; and to say that they exist is an unjustifiable assertion. It surpasses the intellect of the greatest scientific man to prove by means of proper and sufficient evidence the existence of really supernatural things. According to spiritualists the spirits have material properties, and can move tables, chairs, etc., but if so they are natural, not supernatural, and must be subject to natural powers, laws, and conditions. According to idealists, "the more spiritual the more real."

Every body that exists must be related to time and space, it must have successive being in time, and occupy space, and this must be as true of "supernatural" bodies as of natural ones. As properties and relations to known bodies constitute our idea of existence, and real "supernatural" bodies have no such relations, they do not exist; and the chief reasons why many persons imagine that they do are the influence of training and association, the strong desire they have for their existence, and the great difficulty of removing any firmly fixed idea from the human mind. The idea of existence, therefore, of really "supernatural" bodies is a pure undiluted assumption, without any fundamental or really reliable evidence for its support, and is largely a product of personal desire uncontrolled by reason. "The wish is father to the thought." Supernatural things are not material entities, because they are not composed of material substances; they are not immaterial realities like time and space, because the existence of material bodies, or their actions, are not related to them. They are not forms or sources of energy like heat, light, electricity, magnetism, etc., because they have no verifiable effect upon material substances, and because they do not disturb the universal ether, which is the vehicle of transmitting the forms of energy. They are not even mental abstractions of real things or of the qualities, properties, conditions, or relations of real things, but are only mental abstractions of imaginary existences. And "miraculous visions" are not external objective realities, but are usually internal subjective nervous conditions.

As actions are only exhibited by bodies or substances, including the universal ether, a similar mode of reasoning applies to them; and we may

safely conclude that of all the millions of millions of actions continually occurring every instant in the universe, not one is known to occur without relation to time, space, and to other conditions, nor without a natural cause; the existence of "supernatural" actions is as scientifically baseless an assumption as that of "supernatural" bodies, and may be similarly dismissed as the product of unscientific imaginations. Like a single impediment or defective cog-wheel in a complex machine dislocates the entire apparatus, so a single "supernatural" action would disturb the whole natural universe of law and order. "Whatever does not act does not exist" (Leibnitz), and as all power originates in motion, supernatural powers do not exist.

We detect different existences by means of differences of properties and of relations. "What is absolutely incapable of comparison is also absolutely incomprehensible; we only know mutual relations" (Buffon, quoted by Büchner. "Man in the Present," 1872, p. 148). We know of the abstract existence of time by its property of uniformity and endless continuity, and by its relation to succession of events; we know of that of space by its property of unlimited and uniform extension, and the relation of relative direction of all things in it; we know of that of the universal ether by its property of transmitting radiant energy, and its relations to the molecular motions of all substances and bodies; we know of that of invisible molecular motion by the influence of material substances upon each other through the ether; we know of the existence of the distant heavenly bodies, and of matter generally, by their properties and their relations to each other, to time, space, and to ourselves through the universal ether; but when we come to consider what are termed "supernatural" bodies and their actions, we have no proper and sufficient evidence respecting them, because they exhibit no properties, and have no relations to known things by which to prove their existence. There are no relations of the known to the unknowable (G. H. Lewes, "Problems of Life and Mind," 1874, vol. i, p. 64), but there are to the at present unknown. The general relations of things are essentially more important than the things themselves, because they are great truths or principles of which the things themselves are illustrations or examples.

The chief effect of energy in all things, whether animate or inanimate, is to maintain in motion all their parts, *i.e.*, to maintain their relations and properties: in living plants and animals it is partly the continuance of life by propagation of the species; and in inanimate substances it is the unceasing continuance of their molecular motion. Men are born to live and move. All things are related to all things: "Not an atom in the remotest orb can move a hair's breadth without producing in every other atom throughout the universe an effect" (R. A. Proctor, "The Expanse of Heaven," 1874, p. 123). All men are related to all men, and this is the basis of altruism and universal brotherhood and goodness. According to one writer: "To us, things have no reality, except as they are perceived or capable of being perceived" (J. J. Murphy, "Scientific Bases of Faith,"

1873, p. 43). To scientific men, however, there are various things which we cannot directly perceive, and only infer to exist, but which are quite as real as those we can perceive; for instance, time, space, the universal ether, and universal molecular motion. "Time proves all things," and alters many. Infinite time and space afford us glimpses and inferences of eternity. The relations of bodies to each other usually vary in strength in an inverse proportion to their distances apart in time and space. In cases of chemical union the degree of intimacy of relation of substances usually varies directly as the degree of difference of their essential chemical properties; thus metals unite with non-metals, and acids with bases, and whilst much heat is evolved during the act of union in such cases, little or none appears to be set free by the intimate mixture of two portions of the same solid, liquid, or gaseous substance (compare *Nature*, May 18, 1899, pp. 71, 72).

All parts of the human body and all the individuals of a nation are related to each other. It is well known that a diseased organ, for instance the stomach, will make all the other organs unhealthy; that a bad man in a community will make other men bad; that an upright man tends to make other men upright; that local "strikes" of workmen tend to produce "international strikes"; that an ignorant man or nation is a trial to intelligent ones, etc., etc., and such actions have been termed sympathetic ones, "influence of example," etc., they are, however, instances of the great truth, that all things affect all things throughout all time and all space in accordance with the great powers which govern them. "I am a part of all that I have met" (Tennyson)—

> "Nothing in this world is single;
> All things by a law divine,
> In one another's being mingle."

"If the various insectivorous birds of North America were exterminated, within a very few years all the produce of the rich agricultural districts of that continent would be destroyed. If we change the mode of life of any single animal, the change will instantly have an influence on all the other animals whose healthy existence was in any way dependent on its normal function before it was altered" (Semper, "Animal Life," 1890, p. 29).

The properties of all bodies, whether animate or inanimate, and their relations to each other, determine the behaviour of the bodies, and all human conduct is based upon this great truth. Man is related to all things, and everything to which he is related influences him; everything which affects him is more or less his master; he cannot command the laws of nature unless he obeys them; a man's work is his master, and he cannot succeed in it unless he performs it well. A man's duty is his master. Tide and weather are imperious masters. "Time and tide wait for no man." The sun and all the heavenly bodies influence mankind in different ways and degrees, but not in the manner astrologers thought. The sun influences by his heat, light, magnetism, gravitative attraction,

etc., our very existence, and that of all animals and vegetables upon this globe; our ability to navigate the seas is affected by his magnetism; and although he is distant more than ninety millions of miles his gravitative attraction retains the earth and all upon it in its orbit.

It has been said that "time and space are nothing more than the forms or conditions of human thought" (F. W. Farrar. Sermon at Liverpool, September 20, 1896. *The Christian World*, September 26, 1896). This statement agrees with the Berkeleyan notion that the universe is not real, but only ideal, and if it were true the existence of time and space would be dependent upon that of mind. Kant stated that "Space and Time are forms of the mind itself" (Temple, "The Relations between Religion and Science," 1885, p. 14); but we know that the relations of time and space to material bodies, like everything else which possesses properties and relations, must remain when all living creatures are dead, and all mental action has ceased; the existence of the universe does not depend upon that of man or human thought, but that of man and mind upon it. On the other hand, many unscientific persons view as entities not only supernatural things which have no existence at all, but also those which are only abstract ideas of concrete collections of phenomena, such as the human mind or soul, the idea of a man, his ego or personality, his "inmost self," etc. The order of increasing complexity of the most fundamental existences in idea appears to be—simple existence, continuity, uniformity, time, space, matter, and motion.

Persons who are not acquainted with science may ask—Can the abstruse existences, time, space, universal molecular motion, the universal ether, etc., things which we cannot see, smell, hear, taste, touch, handle, or directly perceive in any way, really affect mankind? Science replies, certainly they can; the very existence of man requires time and space, life itself is a variety of the universal motion which exists in all bodies, and without the universal ether man would be blind, and the entire universe in utter darkness, and without heat. And they may further ask—As we have no direct perception of these abstruse things, how do we know that they really exist? Science answers, we know they exist by the power of our intellect, by reasoning from the evidence afforded by things which we can directly perceive, we conclude that they must exist; and we know that this conclusion is true because it is consistent with all known facts, and because it is implicitly and potentially contained in the evidence; we explain the unseen and unknown by the help of the known, and we predict the future and the unknown with certainty or high probability by means of the past and the known. The certain knowledge that they exist is implicitly contained in our personal experiences. It is by means of the universal ether which pervades all Nature and all space, and in which we are all submerged like fishes in the ocean, that we are enabled to perceive all things, and to live and move and have our being.

> "There are principles that make apparent
> The images of unapparent things."
>
> —*Longfellow.*

5. Universality of Law and Order.

All things are in a state of inseparable and mutual connection. The universe is a vast system of law and order in all its details; notwithstanding that according to our narrow views it is largely one of disorder, it is infinitely better arranged than we could have arranged it, and real accident does not exist in it. Everything is so arranged that in accordance with energy and law it could not have been otherwise.

"Good order is the foundation of all good things" (E. Burke). In Nature, all things are connected together by inseparable relations through great laws, and nothing can be disturbed without disturbing the whole. These relations of natural phenomena necessarily extend throughout time and space; and as causation and continuity are endless, the simplest visible movement or invisible molecular change of a body are followed by endless effects in time and infinite ones in space. "Order is heaven's first law." Universal law and order in great things and small ones is one of the most omnipresent conditions of which scientific men have yet been able to obtain satisfactory evidence. General laws do not rule, they are not causes, nor effects, nor actual things, but brief statements of relations of things.

> "The first Almighty cause
> Acts not by partial, but by general laws."—*Pope.*

> "The general order, since the world began,
> Is kept in nature, and is kept in man."—*Ibid.*

> "So from the first, eternal order ran
> And creature linked to creature, man to man."—*Ibid.*

> "For the world was built in order
> And the atoms march in tune."—*Emerson.*

It has been objected that violent phenomena, pain, disease, destruction, waste, etc., cannot be results of universal law and order; they are however as completely consistent with them as other actions and phenomena; this truth will be illustrated in subsequent sections of this book. Geological "elevations and subsidences, inclinations and contortions, fractures, and dislocations, are phenomena, which although at first sight they present only the appearance of disorder and confusion, yet when fully understood, demonstrate the existence of order, method, and design, even in the operations of the most turbulent among the many mighty physical forces, which have affected the terraqueous globe" (Dr. Buckland). Nothing is really disorderly or confused in Nature, it is only in our imaginations that they are so (Spinoza).

A law of Nature cannot be actually broken, but if interfered with, dis-

turbs all its connections; similarly, a single workman neglecting his duty, in some cases stops the action of a large manufactory and enforces idleness upon a considerable number of workpeople. This dependence upon energy and law is an example of the dependence of a collection of parts upon a great moving power, and of the relation of a governing power to individual parts, and is illustrated by the duty of every man to do the greatest good to all men including himself. "Every process has laws, known or unknown, according to which it must take place" (Archbishop Thomson, "Laws of Thought," 1875, p. 1). History, like natural action, must be governed by law (Brooks Adams, "Law of Civilisation and Decay," 1898, p. viii).

Universality of law and order renders Nature intelligible and science possible; without it science could not exist. Men require laws, general truths, and brief formulæ, in order to save themselves brain labour in remembering numerous instances. Various phenomena indicating the existence of a system of order in Nature, have been observed by men during many ages; for instance, the regular succession of day and night, of summer and winter, the rising and setting of the sun and moon, the succession of new moon and full moon, the rise and fall of the tides, the varying altitude of the sun in summer and winter, the orderly movements of the planets in the sky, etc., and the idea of order in all natural phenomena has simmered in the minds of men during many hundreds of years, and has been gradually evolved; but it is only in later times, and in consequence of the numerous discoveries and successful predictions of science, that this great idea has become a settled belief and formed into an universal system. Human laws are imperfect and uncertain, but natural ones are perfect and infallible; Nature will always have her way; but the uncertainty of ordinary human law is proverbial, and arises from the feebleness of man's mental powers.

Nearly all things exist in systems, the members of each system being inseparably related to each other in an orderly manner through unchangeable laws. For instance, the human brain and mind is a collection or system of faculties; the human body is a collection of organs constituting an individual; a family is a collection of individuals; a nation is a collection of families; mankind is a collection of nations; the solar system is a collection of heavenly bodies composed of a sun and its planets; the sidereal system is a collection of suns, etc., and in all these cases not only are the members of a system related to each other, but also the systems themselves are bound together as a whole by immutable bonds; and all men and all things are related to, and dependent upon, all men and all things, through a vast system of mutually related laws. Our bodies, the organs within them, all the things upon this globe, the earth itself, and all the millions of worlds in space, are subject to, and bound together by, the unceasing power of gravity. The sun, its planets, and their moons (except those of Uranus), move in the same general direction. The greatest of all wonders is the self-constituted universe.

Nearly all the old divisions of scientific knowledge, formed when science was less advanced have been found imperfect, and are only now partly retained as helps to our feeble minds. Nearly all the "great gulphs" and "impassable divisions" of knowledge have more or less disappeared. Instead of bodies and actions being only classed in groups they are now also arranged in series; the members of each series merging into each other.

There is now found to be no definite and distinct line of separation between:—(1) movements of molecules and of masses; (2) between solids and liquids; (3) liquids and gases; (4) crystalline and non-crystalline solids; (5) metals and metalloids; (6) chemical compounds and mechanical mixtures; (7) acids and bases; (8) electro-positive and electro-negative substances; (9) magnetic and diamagnetic bodies; (10) organic and inorganic substances; (11) animate and inanimate bodies; (12) animals and vegetables; (13) vegetables and minerals; and (14) mental action and physical action, automatic and volitional, etc. There are plants much like animals and animals much like plants; "aethalium septicum" may be classed as either an animal or vegetable" (Huxley, "Lay Sermons," p. 129). There are diseases and malformations of crystals as well as of animals; fatigue of metals as well as of muscles; there are vegetables which are sensitive to odour and to touch like animals, which can sleep and be sent to sleep by means of anaesthetics; there are living earthy growths at the bottom of the sea which have the simple geometrical forms of crystals; there are metals (and carbon) which grow to the forms of vegetables, *i.e.*, electrolytic trees of copper, moss silver, etc. There are some species of animals, (*i.e.* polypes), which, if cut in pieces, each piece becomes a perfect animal, like each slip of a geranium grows to a geranium, or bit of crystal to a crystal. "Tarbellarias and their relatives have no alimentary canal, the food taken by what answers as mouth passing as directly into the general tissue as does the material which an ordinary root imbibes from the soil" (Asa Gray, "Natural Science and Religion," 1891, p. 17). Similar to animals, some plants are herbivorous and some are carnivorous; Dionoea and Drosera are carnivorous (*ibid.*, p. 18). There are plants which have automatic movements like animals, the Dionoea, for instance, which throw out tendrils and feel for points of support (*ibid.*, p. 23). Throughout organic nature, the extremes are far apart; the interval is filled with gradations (*ibid.*, p. 42). Thought merges into nerve-action, and nerve-action into muscular and bodily movements by degrees. There are all grades of moral conduct from those of the highest goodness to those of the greatest "wickedness." Intelligent moral conduct merges by insensible degrees into blind automatic moral conduct. And many other examples. The most apparent exceptions to these statements are the atomic weights of the elementary substances.

Nearly all substances, and many properties of substances, can be arranged in series without breaks or intervals in the lists. Under suitable conditions of temperature and pressure, solids, liquids, and gases, and even the atomic weights of the elementary substances (See *Nature*, vol. 60,

p. 105) form a continuous order. Similarly with animate and inanimate bodies, animals, vegetables, and minerals; consciousness and unconsciousness. Conductors and non-conductors of electricity may also be arranged in a continuous list, the one gradually merging into the other. Similarly with electro-positive and electro-negative substances; and with metals and metalloids, paramagnetic and diamagnetic bodies; also with acid, neutral, and alkaline substances. The elementary bodies are capable of being arranged in systematic orders termed "periodic series." Solids, liquids, and gases, may also be arranged in a continuous series according to their differences of specific gravity, specific heat, etc. Heat, merely by change of degree, merges into cold; pleasure in great excess becomes pain; sweetness in excess merges into bitterness, etc. The relations of all things to each other and to the conditions under which they exist, such as gravity, pressure, temperature, heat, light, electricity, magnetism, etc., are gradually being investigated, and a vast system of law and order is already revealed to mankind by the labours of scientific men.

But although phenomena are essentially continuous and exist in series, science affords us plenty of instances of apparent divisions and breaks in the series, thus forming well-marked groups which render us great assistance in mental classification. Thus all the thousands of different crystalline forms may be arranged in groups, and the groups themselves in series. Beginning with the simplest:—(1) we have the regular tetrahedron and cube with the cubic system and all its numerous allied forms; (2) the square prism and its system; (3) the right prismatic system; (4) the oblique prismatic one; (5) the doubly oblique; and (6) the hexagonal one. In each system we have the more complex truncated and other derived and modified forms, right-handed and left-handed modifications, twin crystals, crystals having the forms of plants, etc. "Nature's laws are rigid. The crystal forms itself, if no disturbing influence alters the formation of the crystal, in exact agreement with law. This is no exception to law, it is a confirmation of it" (*The Open Court*, No. 165, p. 2585). "All discord's harmony not understood." "Regular the most, when most irregular they seem."

By the geometrical researches of M. Fourlinnie (*Chemical News*, October 2nd, 1896. *Bulletin de la Société Chimique de Paris*) an important hypothesis has been raised which strikingly exhibits the simplicity and perfection of the system of construction of natural substances, by its consistency with the fundamental fact of geometry that there can exist only five regular solid forms (the "Platonic solids"), possessing equal axes, equal faces, and equal angles. It is:—(1) that the atoms of all the elementary substances of chemistry are composed of the same unique and homogeneous substance; (2) that those of the well-known different chemical families of the non-metallic elements have different geometric forms; (3) that those of different members of the same family have the same form but different dimensions; (4) that the differences of property of those belonging to different families are due to the differences of geometric

form; and of those of the same family to the differences of magnitude; and (5) that the forms of the atoms of the five chemical groups correspond with those of the five regular polyhedra of geometry. He finds that the volumes of the hexahedron, octohedron, dodecahedron, and icosohedron, inscribed in the same sphere, are in the same relative proportions, viz., 19, 16, 14, and 12, as the atomic weights of fluorine, oxygen, nitrogen, and carbon, and he infers that the forms of their atoms probably correspond with the geometric forms, the regular tetrahedron being assigned to hydrogen. A further extension of this rational hypothesis would be the calculation and possibility of prediction of the properties of substances from geometric data. J. Bayma ("Molecular Mechanics," 1866), has also investigated this subject, and largely predicted some of the same conclusions.

"Look round the world; behold the chains of love
Combining all below and all above,
See plastic nature working to this end,
The single atoms to each other tend.

"See matter next, with various life endued,
Press to one centre still, the gen'ral good.
See dying vegetables life sustain,
See life dissolving vegetate again;
All forms that perish other forms supply.

"Nothing is foreign, parts relate to whole;
One all-extending, all-preserving soul
Connects each being, greatest with the least;
Made beast in aid of man, and man of beast;
All served, all serving; nothing stands alone;
The chain holds on, and where it ends, unknown."

—*Pope.*

Although we commonly speak of the universe and mankind as being "governed by law," the active governing powers, the real causes of phenomena, are not laws but forms of energy, such as heat, light, electricity, chemical activity, etc., and laws are only abstract terms expressing uniformities of relation or action of substances. We are not really "governed by laws," but by the energy which they represent; laws would be largely ineffective if the application of punishment or force was slow or uncertain; men often commit wrong acts when they think that punishment is distant or may not occur at all. "A law of Nature is not a uniformity which must be obeyed by all objects, but merely a uniformity which is, as a matter of fact, obeyed by those objects which have come under our observation" (S. Jevons, "Principles of Science," 1887). "The laws of Nature are simply statements of observed relations" (J. P. Cooke, "The Credentials of Science," 1893, p. 161). "Very few of the recognised laws of Nature are absolutely definite, and of these few, with the exception of the law of gravitation, the invariability must be assumed, for it cannot be proved, at

least absolutely. In the present state of knowledge we should class as amongst the definite laws, the law of conservation of mass, the law of conservation of energy, the laws of motion, and the law of gravitation" (*ibid.*, p. 171). According to these statements the extent of those laws may possibly have some limitation? Laws having no apparent exceptions are very few in number. There cannot be two universal laws contradicting each other. "There are no two laws of right and wrong" (Maarten Maartens). The great laws of Nature are not human inventions, but truths impressed upon mankind by long experience and by inference from it; *i.e.*, by means of sensation, reflection, and inference.

We arrive at general laws by a process of *induction*, *i.e.*, by observing a real similarity of action or relation, either qualitative or quantitative, in a number of different instances, and attributing these similarities to the same causes or conditions; but the induction is always a matter of degree, and is never perfect because we can never exhaust all possible cases, and we may in a research, at the very last moment, discover a real exception which compels us to explain in a somewhat different manner the entire series. This may be illustrated by the action of Babbage's Calculating Machine, which may go on uniformally for any great length of time and then suddenly change; thus, "if every letter now before the reader's eye was changed into a figure, and if all the figures contained in a thousand such volumes were arranged in order, the whole together would fall short of the vast induction the observer would have had in favour of the truth of the law of natural numbers; yet shall the engine, true to the prediction of its director, after the lapse of myriads of ages, fulfil its task and give that one, the first and only exception, to that time-sanctioned law" (Babbage, "Bridgewater Treatise"). The fact, however, that an engine can be constructed, which, after going through any required vast number of motions in accordance with a first law, shall be able then to suddenly change and commence to work according to a different one, does not show uncertainty of scientific law, but still further proves the unlimited extent of its operation and certainty; and constitutes a good illustration of the principle of evolution and of the phenomenon of differentiation, according to which considerable changes are in some cases more or less suddenly produced in bodies in accordance with law by very small causes after long periods of time. Such phenomena are not unusual; there are changes produced in the human organism which do not occur until the heart has beat many millions of times; there are also astronomical phenomena which only happen to a heavenly body after many thousands of years of continuance of its uniform motion. Considerable changes are often produced by apparently insignificant exciting causes: thus a mere spark liberates immense energy from a great mass of gunpowder which during many years has been perfectly inert; a slight movement of a switch on a railway determines a great alteration in the direction of a train after a very large number of miles have been travelled. The fundamental laws and principles of science have been further confirmed by *deduction* and verified by fulfil-

ment of prediction in an immense number and great variety of cases, as well as by their consistency with universal system and order, and with all known truths, even in their seeming exceptions; the verifications of the truth of them by deduction is so incessant, varied, and vast in number, that there exists not the remotest chance of their ever being set aside, our form of statement of them can at the utmost be only slightly modified; and their truth will undoubtedly be vastly extended by increased experience. Verification by extensive variety is far more conclusive than that by a great number of similar instances.

The truth of a great scientific law is rendered practically infinite and certain by its consistency with all known facts, and with the all-embracing one that the entire universe is framed upon an orderly plan, and could not exist if it was not; and further by means of deduction and prediction, *i.e.*, if the law is true, certain unknown phenomena either exist or will happen; for instance, by an act of induction a new gas, helium, was many years ago inferred to exist in the sun, and has since been actually found and collected on the earth; and certain new metals were by deduction predicted to exist, and multitudes of eclipses and transits to occur, and these have been duly verified, so that the degree of uncertainty of completeness of the great laws of Nature is incalculably small. It is because the universe is undoubtedly formed upon a perfectly orderly and natural plan that a greater number of important discoveries have been made by accepting the great laws of science as true than by all other methods put together, whilst none appear to have been made by the help of supernatural hypothesis. It is also because all things, and all their actions, are consistent with each other and with all known truths that we are justified in concluding that all the great globes in the universe are substantially composed of the same substances as the earth, and numberless spectroscopic analyses have confirmed that inference. In a similar manner we have inferred that the molecules and atoms of substances, equally with the great globes in the sky, obey all the great laws of motion, and that particular inference has also been confirmed by its consistency with all known truths related to it.

Notwithstanding the immense amount of evidence of the uniformity of the laws of Nature shown by the phenomena of all the sciences, and especially by the simpler ones astronomy, mechanics, hydrostatics, pneumatics, etc., without a single known exception in a countless number of instances, there are many theologians who doubt the existence of that uniformity and its necessity. Thus the late Cardinal Newman said: "It seems safer to hold that the order of Nature is not necessary, but general in its manifestations" ("A Grammar of Assent," 1870, p. 69). It is evident that if, in accordance with this statement, it is not perfectly safe to believe in the orderly necessity of Nature, notwithstanding the practically infinite amount of evidence in support of it, we should not be justified in believing in the necessity of anything, not even that the next hour will follow the present one. We must, however, in considering the above statement, remember that in accordance with the great truth of universal causation

each man believes as he must under the conditions in which he is placed, *i.e.*, if he is unfamiliar with the great truths of science he will not fully believe them. The same writer speaks of the "confusion" of the movements of the earth in its orbit, and says "the confusion is a fact"; but the real confusion is in the mind of the writer, and not in the movements of the heavenly bodies, because the more we learn about them, notwithstanding the increase of complexity of movement, the more perfectly systematic do they appear.

> "A little knowledge is a dangerous thing,
> Drink deep or taste not the ethereal spring."
> —*Pope.*

It has been repeatedly asserted, but without proper and sufficient evidence, that "order must always be the result of intelligence"—that the order of the universe must be due to "an over-ruling mind" (J. P. Cooke, "The Credentials of Science," 1893, p. 24). These statements are far from correct: the perfect order of the universe, and the universal laws which express it, are only apparently, and not really, "the result of intelligence" or of "an over-ruling mind"; they are necessary consequences of the properties, structures, and relations of existing substances and bodies, like the orderly movements of a watch or a steam-engine are results of their constituent parts.

The universe goes on in a perfectly regular manner in accordance with the first law of motion, that "a body in a state of motion will continue in that state of motion until some cause arises to prevent it," like its immeasurably more simple imitations, a clock or a steam-engine. Further, universal law is not a product of an universal mind, because there exists no known mind without a brain, whilst we have thousands of millions of instances of mind accompanying the existence of brain in men and animals; we have not a well-verified one in the absence of nervous substance. The mind of man must, to a large extent, agree with universal law and order, simply because the universe has to a certain extent educated and trained the human brain to be its mirror and representative. If all bodies and substances are related to each other by orderly laws, their actions and behaviour must likewise be orderly, and have the appearance of intelligence; and if the energies of Nature, in accordance with the properties, structures, and relations of bodies and substances, produce law and apparent "design," natural law does not require "a law-giver," nor natural design "a designer."

Lawless minds and unscientific ones are often frightened at the truthfulness and certainty of natural law; ostensibly because it is "cold," "bitter," and "unfeeling," but really because it ignores and disappoints their selfish desires and fixed unprovable beliefs. Why is it that mathematical laws, the multiplication table, etc., which are equally "cold," do not equally alarm them? It is simply because these do not appear to frustrate their irrational wishes. "Of the aspects of the material universe there is

none which is more appalling to the religious mind than the reign of law" (*ibid.*, p. 160), because it dispenses with the cherished idea of an overruling mind. To the really scientific man, however, knowledge of universal law and order imparts nobler ideas, purer thoughts, a feeling of independence of an arbitrary will, perfect confidence and peace of mind—that "peace which passeth all understanding," which those who know not the laws are unable to understand or appreciate. The effects of copious knowledge of the great laws of science upon the minds of those who most understand them are best seen in great discoverers. "The great pioneers of science have been men of ideals, whose imaginations were regulated by education and chastened by wisdom. They have been men of courage and perseverance, who followed out their convictions through every discouragement. They have been men of entire truthfulness, who have never hesitated to submit their doctrines to the test of crucial experiments, and to abide by the issue. They have been men of the most scrupulous conscientiousness in attention to minute details, regarding themselves as responsible to the Giver of all truth for accuracy in every observation, and for exactness in every statement. Finally, they have been men of modesty and of reserve in judgment, realising, as no other men ever have, how boundless is truth, how limited knowledge, how intricate the problem of Nature, how weak in comparison the intellect of man" (*ibid.*, p. 259). The idea of omnipotent energy and law imparts a far greater feeling of certainty than that of an arbitrary "law-giver" influenced by feelings and passions, because whilst the former is immutable, we never know for certain how the latter will act.

There is one aspect of the great laws, truths, and principles of science which is very important, and requires special recognition, and it is, that if they are what every really scientific man firmly believes them to be, viz., universal, immutable, and exact, they must implicitly or potentially contain within themselves all present and future knowledge, and be therefore capable of affording truthful and complete answers to all possible rational questions; they have already supplied hundreds of thousands of such answers to the questions of scientific men, and will doubtless supply millions more in the future, not suddenly, but gradually, as mankind acquire sufficient information and ability to properly interrogate them. Those of gravitation and mechanics disclose to us the future history of astronomy respecting eclipses, transits, etc., of the heavenly bodies; those of light inform us of the existence of elementary substances yet to be obtained; those of chemistry and periodic and homologous series tell us of metals and organic compounds which will be obtained in the future; and in like manner those which relate to man will gradually give us information respecting the future of the human race, and we may safely infer that a true scientific religion will be gradually evolved, and men will cease to murder each other in order to support blind theological beliefs—

> Great laws, their innermost contents
> Can settle all our arguments.

In them lie all the future hopes, happiness, purer morality, truer religion, "the millennium," and real heaven of mankind. They are the real "Mount Pisgah," affording a view of "the Promised Land"—the real "Light of the World."

The question may be asked, Why do the chief teachers of human conduct go on trifling with great evils by offering unprovable beliefs, when a knowledge of the great laws of science would enable them in many cases to go to the root of the matter, and give rational answers to many deeply interesting questions of humanity? The laws themselves supply the answer, viz., that all men obey the law of causation, and do as they must under their special conditions and environments; and they must advance at precisely the rate they are capable of under those conditions and circumstances. It is not blaming anyone to say that a very large number of such teachers, highly cultured in other ways, show by their writings that they are not properly trained in knowledge of the great truths of science, and their applications to questions of morality, theology, and religion.

The universal order and manifest obedience to law throughout all Nature, from the largest heavenly bodies to the smallest living plants and animals, to the molecules of matter invisible even by help of the microscope, and even the incomparably minute movements of the universal ether; prove that there must be a complete scientific basis of all phenomena of inanimate nature, of man, morals, and religion, and that if supernatural intervention existed there would be real disorder in Nature.

Notwithstanding the overpowering and constantly increasing amount of evidence of the universality of natural law, there are many persons who persist in believing that it is suspended in the case of the human will. The following is one of several instances mentioned in this book :—"The superstition which saw in all natural phenomena the action of capricious Deities was not more irrational than the superstition which sees in them nothing but the action of Invariable Law." Men "were right when they looked upon a change of will as the efficient cause of other changes without number and without end." "It is an unspeakable comfort when we come to close quarters with this vision of Invariable Law seated on the Throne of Nature, we find it a phantom and a dream—a mere nightmare of undigested thought" (The Duke of Argyll, "Reign of Law," 1871, pp. 389-390). The idea that all natural phenomena occur in accordance with invariable law is certainly not a "superstition" nor a "dream," because it is consistent with all known facts, and because no real exceptions to it have ever been proved by means of proper and sufficient evidence. It is true that in consequence of our incapacity to conceive the absolute, the invariability of natural law may be viewed as a mere probability, but, as the sun has arisen daily for millions of days without a single omission, the probability is millions to one that it will rise to-morrow, and it would be irrational to act as if that phenomenon was variable. Whilst it certainly is a comfort not to have our fixed erroneous ideas disturbed, it is a still greater comfort to know that we have natural laws of such an incompre-

hensibly great degree of certainty, instead of an arbitrary will, to rely upon in all our thoughts and actions, and even those who disbelieve in invariable natural laws do not hesitate to rely upon them in nearly all their actions. According to the most reliable scientific views, "a change of will" is not "the efficient cause" of any natural phenomenon but only an initiating cause or condition, much like a spark is to the phenomenon of explosion of gunpowder.

Much has been said about "the uncertainty of science," but real science is nearly if not entirely synonymous with certainty; doubts have also been cast upon the great truths of science, for instance, upon that of universal causation, because the process of induction is never complete; but it is irrational to doubt the certainty of a well-verified law merely because our experience respecting it is not unlimited; mere human experience does not in any degree limit its universality. The proper test of scientific certainty is usually not unlimited experience, induction, and perfect knowledge, because those we can never have, but universal consistency and successful inference and prediction; it does not require complete knowledge of the sun, the moon, and the earth to successfully predict a solar eclipse, but only suitable and sufficient data respecting those bodies. According to the late Professor Jevons: "No single law of Nature can warrant us in making an absolute prediction. We must know all the laws of Nature, and all the existing agents acting according to those laws, before we can say what will happen" ("The Principles of Science," 1887, p. 739). But although our knowledge of any one thing in any case is never complete, our knowledge of all about it that is requisite for a particular purpose may be so, and successful deduction and prediction proves this. If we are certain of nothing that will happen until our inductions respecting it are complete, or our knowledge of it is perfect, we are not certain that we shall die, nor of any event until it has actually occurred. It is like "straining at a gnat and swallowing a camel" to disbelieve in well-verified scientific truths, and at the same time firmly believe in unprovable doctrines, such as those of "transubstantiation," "a second advent," "a future life," or an "universal intelligence"; and we may very properly ask—Where are the predicted "second advents" of Christ, Charlemagne, Barbarossa, Marko of Servia, Arthur and Olgar Danske, King Sebastian, or of Quetzalcoatl?

Professor Jevons also expressed his "strong conviction that before a rigorous logical scrutiny the Reign of Law will prove to be an unverified hypothesis, the uniformity of Nature an ambiguous expression, the certainty of our scientific inferences to a great extent a delusion" . . . "our experience is of the most limited character compared with what there is to learn, whilst our mental powers seem to fall infinitely short of the task of comprehending and explaining fully the nature of any one object" (*ibid.*, preface, p. xi); but he also stated—"Happily the universe in which we dwell is not the result of chance, and where chance seems to work it is our own deficient faculties which prevent us from recognising the operation of Law and Design." . . . "The same natural laws can be

detected in operation in every part of the universe within the scope of our instruments; and doubtless these laws are obeyed irrespective of distance, time, and circumstance" (*ibid.*, pp. 2-3).

We have to consider scientific certainty in two very different ways; first, the certainty of the phenomena of Nature in themselves, and second, that of man's interpretation of them; the former is perfectly reliable, but the latter is frequently not so. Certainty is a matter of degree, and whilst we may truly consider the degree of certainty of the actions of natural energies under exactly the same causes and conditions as being absolutely perfect, that of man's interpretation of them, and his inferences from them range from nothing to an extremely high degree, and in some cases to practical perfection. The evidence of certainty in all the phenomena of Nature themselves is so vast and so varied, that altogether independently of the degree of uncertainty of our knowledge, we are rationally bound to believe that the system of natural energy and law is entirely devoid of chance. The same complete degree of certainty is no doubt attached to the complex phenomena of human conduct as to the simplest geometrical relations, but our minds are too feeble at present to perceive it.

With regard to the certainty of existing knowledge it is in nearly all cases a matter of degree, and this is solely a consequence of our limited powers; the certainty of astronomical predictions of solar eclipses is incomparably greater than that of the theological prediction of "a resurrection of the body." Just like the surface of a lake is a mirror of the sky, and the images upon it are liable to be disturbed by ripples on its surface, and to be dimmed by intervening mist, so the brain or mind of every man is a very imperfect reflection of the universe, and liable to be rendered untruthful by many causes. But the certainty of law and action in the universe does not depend upon perfection of the human mind; the defects of the human brain have very little influence upon the great laws of the universe, the latter would remain the same even if the brain of man and man himself were to entirely disappear. It is perfectly true that the human mind is a very imperfect mirror of Nature; that our knowledge respecting the very smallest thing is extremely incomplete; that many of our important conclusions are only probable; and that the data of many of our inferences are constantly increasing and are capable of vast extension; but these facts do not justify the conclusion that the death of a man is a mere probability. To call the great truths of science or the prediction of eclipses "uncertain" is a mere question of the meaning of the word and may be disregarded. The certainty of scientific *deduction* will be subsequently considered.

Many important consequences follow from the great idea that the universe is a perfect system of energy, law, and order, in all its parts:—(1) that every thing and action in it must be essentially consistent and harmonious with every other one; (2) that the system of natural knowledge which represents the universe must be a system of truth; (3) that every fact must be consistent with every other fact; (4) that the system,

being perfectly truthful, must be essentially good, and that essential evil does not exist in it; (5) that our noblest rational ideas will sooner or later be found to be true ones; (6) that everything is related, either directly or indirectly to everything; (7) that everything influences everything, and that which disturbs one disturbs the whole; (8) that it is in consequence of universal energy, law, and order, that evolution and progress of civilisation are possible; and (9) that as the system is sufficient to account for all we really know and experience, there is no necessity for a supernatural explanation of any natural phenomenon.

6. Universal Design.

"Beneath this starry arch
Nought resteth or is still,
But all things hold their march
As *if* by one great will."
—*H. Martineau.*

It is constantly being asserted, and various books have been written to prove, that the whole of Nature exhibits evidence of mental design, contrivance, purpose, and adaptation of means to ends, and that the universe and all that is in it, down to the minutest insect was purposely designed, and is unceasingly superintended, by a personal and universal mind. Thus, "Overpressingly strong proofs of intelligent and benevolent design lie around us, and if ever perplexities turn us away from them for a time, they come back upon us with irresistible force, showing to us through Nature the influence of a free-will, and teaching us that all living things depend on one everlasting Creator and Ruler" (Lord Kelvin, Meeting of British Association, Oxford, 1894). That nearly everything in Nature has the *appearance* of being designed by an universal mind is perfectly true, but that all Nature is really so designed and arranged, is a superficial conclusion and not justified by the evidence:—(1) because there is no real evidence of the existence of an universal brain, without which an universal mind could not exist; (2) because an infinite system of energy acting according to perfect law and order is fully competent to produce complete adaptation of means to ends without the aid of a mysterious infinite mind, and if it were not so the system would be self-destructive; and (3) because the human mind is trained by its environments to represent the universe, and this, by making the two look alike, imparts to the universe the appearance of being contrived and governed by mind. The universe is almost infinitely more powerful than man, and has millions of millions of times more influence upon him than he has upon it. Man is evolved by universal powers, and not the universe by man; light does not adapt itself to suit our eyes, but our eyes to suit the light. To suppose that the universe was made to fit the mind of man, and to have been

purposely adapted to the requirements of every one of the hundreds of thousands of different kinds of animals, insects, and vegetables, instead of they being compelled to adapt themselves to it, is a highly inconsequent idea. It is well-known that we are frequently obliged to alter our ideas in order to make them consistent with the truths of Nature, but that Nature never alters its truths to fit the human mind. "Human reason is but the mirror which reflects the universe" (Büchner, "Force and Matter," 1884, p. 372). "Sight did not exist *before* the eye, nor speech *before* the tongue, but the reverse. On the same basis we cannot say that the stag and the doe have long legs in order that they may run fast; but that they run fast *because* they have long legs" (*ibid.*, p. 223); walking evolved feet, not feet evolved walking; light evolved eyes, not eyes evolved light; sound evolved the power of hearing, not hearing evolved sound; and as the earth existed previous to man, man did not evolve the earth, but the earth evolved man. Nature makes man's mind largely an image of itself, and hence man imagines the cause of the universe to be a manlike deity. Although inanimate energies, acting according to definite laws, determine events throughout all time and space, they, being unintelligent, have no "intentions," "designs," or "purposes," in doing so. Events do not happen in Nature for any subsequent advantage to man or to anything else, but simply as consequences of previous causes and conditions; thus we do not live for the *purpose* of eating, drinking, and moving, but we eat, drink, move, and live, because we are compelled to; nor do we live for the purpose of dying, we die because we must. The molecular movements in bodies are not for the purpose of producing properties, but the movements and properties are inseparably united together, and cannot be separated by a mere change of purpose; the properties are effects of the movements. Whilst it is very flattering to mankind to say that each human being is the object of attention of an infinite mind, the honest question is, is it true?

"Will any man in his senses say that it is less difficult to conceive how the world came to be, and continue as it is, without, than with, an intelligent governor of it?" (Butler); the reply to this is very simple; our ability of conception is not a sufficient test of truth; it is often very much more easy to conceive a false explanation than a true one—true explanations are in many cases extremely difficult to discover; for instance, it took mankind many hundreds of years to discover the true explanation of lightning, the rainbow, the tides, the movements of the heavenly bodies, etc., to prove that they were not actions of deities, as they were previously thought to be. As the various modes of mechanical energy, acting according to a perfect system of laws, are sufficient to cause and control the movements of a watch, a waterfall, the heavenly bodies, the motions of molecules in chemical actions, the phenomena of heat, light, electricity, the universal ether, and a multitude of others, so are they doubtless competent to cause and regulate all the phenomena of so-called "design" which has been ascribed to an "everlasting ruler." How thousands of

intelligent men, who are constantly studying, preaching, and writing about the existence of a Divine Mind, can be apparently oblivious to the fact, so vitally affecting their own special subject, that there are a thousand millions of minds each with a brain, and not a single one without it, is a striking psychological phenomenon. According to one writer:—"Modern science holds that there may be design in the universe, but that to penetrate the design is, and probably always will be, beyond the power of the human understanding" (Seeley, "Natural Religion," 1882, p. 12); according to scientific views, however, the explanation is very simple, viz., that the chief so-called "design" of the universe appears to be the same as each of its separate parts, viz., maintenance of an incessant state of motion and change.

It is further extensively believed that the universe is purposely and specially designed for the benefit of man—this is another apparent truth, but not a real one—because (1) the primary or special "objects" of the universe are self-maintenance and evolution, not mere human advantage; (2) man is incessantly being sacrificed to greater objects than himself; (3) it is not man that has evolved the universe, it is the universe which has evolved him, and made his mind a copy of it; before man can use the energies of Nature for his own advantage he must obey them, therefore he is their servant and they are his master. Man is not of greater importance than the universe, but incomparably less; (4) it is not man alone, but all living creatures, that derive benefit from external nature, so that the universe, if contrived at all, was not contrived for his welfare alone; and (5) a perfect system of energy, law, and order, will doubtless account for all things, from the greatest to the least, and in such a system all things are related to all things; Nature is not better suited for the well-being of a man than for that of a horse or any other animal under their normal conditions; each living thing is compelled to live, man and other animals cannot choose when they shall be born, and only to a small extent when they shall die; and the essential difference in the question of welfare between man and all other animals is, that he has a more complex structure, and in some respects more sensitive nerves than they have, and is consequently subject to a greater variety and degree of pleasure and pain. All living creatures are compelled either to adapt themselves to their environment, or be punished by pain or death. When anything goes wrong between man and natural powers, it is he that is punished. The superficial and largely fallacious idea that the universe in general, and the earth in particular, was purposely contrived for the pleasure of man, although an improvement upon previous and still more fallacious ideas, has caused an immense amount of mental misery, and nearly every intelligent, thoughtful person must have serious misgivings as to its truthfulness because of the great amount of pain and misery he sees around him.

The idea of the existence of an intelligent personal Deity superintending the universe has been called in question by numerous writers, including both orthodox and heterodox; thus an early author says, "He cannot

properly be even said to exist, for He cannot be identified with any one thing that exists, He is rather to be called absolute non-existence;" another "speaks of the supreme unity as above existence"; a third "speaks of God as above substance and life and intelligence" (T. M. Herbert, "Modern Realism Examined," 1879, p. 395; Dean Mansel, "The Gnostic Heresies," pp. 146, 147). In Germany, logical thought has stripped the idea of God, one by one, of the attributes of personality, self-consciousness, consciousness (G. J. Stokes "Objectivity of Truth," 1884, p. 91). "Schelling speaks of the absolute as neither ideal nor real, neither thought nor being," and "Hegel identifies pure existence with pure nothing" (T. M. Herbert, "Modern Realism Examined," 1879, p. 395; Dean Mansel, "The Gnostic Heresies," pp. 146, 147). Yet another writer says, "All language about God is metaphorical, whether we call Him a father, or a rock, or a house of defence, or a buckler, or a tendency, or a cause, or a voice in the conscience of man. All we can do is to choose the best metaphor, to remember that it is a metaphor, and that the spiritual reality is far better than anything we can conceive" (Rev. J. M. Wilson, "Essays and Addresses," 1887, p. 153). The common idea of God is, "Him in whom we live and move and have our being," but this would more fitly describe the universal ether. One writer, viz., Hartmann, has spoken of "the transcendental misery of God" (G. J. Stokes, "The Objectivity of Truth," 1884, p. 100). Another says, "It seems to me impossible to obtain from science any clear ideas respecting the reality of an Almighty personal God." . . , "Science tells us nothing of the infinite attributes of an Almighty Being; it presents to us no personal infinities, whether of power, beneficence, or wisdom" (R. A. Proctor, "Our Place among Infinities," 1875, pp. 1, 2). Another writer states, "it is absurd that an intelligent Creator would create animals with useless organs," such as "the embryo Greenland whale which has teeth," etc. (J. J. Murphy, "Habit and Intelligence," 1869, vol. i, pp. 248, 261); many other similar anatomical and physiological objections have been made which I need not quote. It is well-known to naturalists that nearly all the higher plants and animals have greater or less "imperfections" in their structure, and have either undeveloped, useless, or degenerated organs (consult Büchner, "Man in the Present," etc., 1872, p. 107). As we possess no real and sufficient evidence of a personal designer of the universe, it necessarily follows that we should not regard the phenomena of Nature as being designs, purposes, or intentions, but as effects or consequences of pre-existing conditions of energy or motion acting in accordance with what we term laws, principles, and general truths, under the conditions of time and space; but if there really is "universal design," every eddy of air and of water, the incessant motion of every molecule and atom of matter throughout the universe must be constantly superintended, and have a special pre-intended purpose; but to nearly all scientific men who are familiar with the practically infinite variety of vibrations of the various forms of energy, and the utterly incomprehensible number of molecules

and of their motions in even a cubic millimetre of matter, such superintendence is not only utterly inconceivable, but incredible; in comparison with this, it would be far less irrational to believe that in the case of every one of the twelve hundred millions of human beings on this globe, "even the hairs of our head are all numbered"; but what sensible person believes even the latter less incredible statement?

According to the late Dr. J. A Symonds, "If, on a desert island a tool or a piece of machinery were discovered, which furnished evident marks of the operation of human contrivance, there would be no intimation from this source alone that the designing mind was, or was not, connected with a brain and nerves; the knowledge that the human mind acts in concert with an appropriate organisation would be the result of other kinds of experience. The evidence, then, of the Divine Mind is contained in the effects of its operations; and we are ignorant whether any organisation is, or has been, made use of by this exalted principle. The evidence of human or animal mind is also contained in its effects; but we likewise know that it never produces these results, except in co-operation with the nervous system" ("Miscellanies," 1871, pp. 132-133). According to a recent author (Winwood Reade), "man will never attain to his full power as a moral being until he has ceased to believe in a personal God" ("The Martyrdom of Man," 14th edition, 1892, p. 524).

There is an old argument that where there is a watch there must have been a watchmaker, and therefore where there is "design" there must have been "a designer"; but the force of this argument has been destroyed by the discovery that in multitudes of instances inanimate powers are capable of producing the phenomena we call "design" (see sections 49-50), and by the fact that nearly every part of a watch is now made by means of inanimate machinery, and the watchmaker only puts the pieces together. The existence and properties of each individual thing depend upon the substances and circumstances under which they were formed and exist, and not upon an omnipresent intellect.

The foregoing explanation that "universal design" is not real, but only apparent, disposes of a whole multitude of inconsistencies, appears to agree with all known facts, and to be contrary to none; and as the real consistency, and consequently the "apparent design" of all parts of the universe harmonises with omnipotent natural powers and immutable laws incomparably more so than with the idea of a living intelligent designer, it is a moral duty to believe the former rather than the latter. The ideas of a superintending designer are very indefinite—thus God has been called "a great spirit," "the great formless unseen," "a vast co-ordinating force," "the vast unseen," and by a great number and variety of other titles. "It is evident that the belief in a great mind or will as the cause of the universe must fall to the ground" (Crozier, "Civilisation and Progress," 1892, p. 196). As a cause and its effect are often different, it does not necessarily follow that where there is invariable order and perfect system there must be intellect, otherwise we should be obliged to conclude that a crystal, a

tree, a watch, a steam-engine, a cotton mill, etc., etc., must be endowed with intelligence. A one-sided study of Nature develops a one-sided mind.

7. Universal Consistency.

All parts of Nature are seen to be perfectly consistent with all other parts when we view them in the most complete and comprehensive aspect, and even in cases where we cannot perceive it they necessarily must be so because they are governed by universal powers acting in accordance with immutable laws. The very fact that an effect is produced by its cause proves that the two are consistent with each other. We know that there are not only an immense number of substances which do and may exist, millions of inferences which must be true, and of actions which do and may occur, but also a vast number which are impossible. Similarly, in accordance with the fundamental fact that "truth cannot contradict itself," we know that all assertions which are not consistent with all known truths are impossible. Even the energy of the entire universe, or, in theological language, "the omnipotence of God," cannot make contradictories agree with each other, nor make anything in the universe different from what it is under the influence of the whole of its causes, conditions, and circumstances present at the time, because that itself would be contradictory to an universal system of law; it is evident, therefore, that there exists a limit to what we call "omnipotent power, as well as to possible truths, and that that limit is consistency.

These great qualitative facts agree with universal experience and with the fundamental and well-known axioms of logic, "a thing cannot be and not be," "a thing must either be or not be," and "contradictories cannot coexist," thus a body cannot be in two different places at the same time. Quantitative truths are similarly related to experience, and to the well-known but less comprehensive axioms of mathematics, such as, "the whole is greater than its parts," "things that are equal to the same thing are equal to one another," "if equals be added to equals the sums will be equal," or "if equals be taken from equals equals will remain," "number is independent of the order of counting, a sum is independent of the order of adding, a product is independent of the order of multiplying," etc. Statements which contradict any of these are inconsistent and untrue.

The chief functions of consistent laws, principles, and general truths are:—(1) to enable us to predict; (2) to obviate the trouble and expense of making observations and experiments; and (3) to enable us to arrive at true conclusions in cases where experiments or observations cannot be made, and in those comprehensive and complex ones which the human intellect is too feeble to grasp. Knowledge of the great principles and truths of science not only helps us to determine beforehand what substances can exist, and what actions and conditions are possible and may

occur, but also what ones are impossible and cannot be, and this ability is often of very great value in discovering new substances and phenomena; for instance, various elementary bodies, alcohols, etc., were found partly in this way. Mendelèef predicted, in this manner, the existence of gallium, scandium, and germanium, and they were subsequently discovered and obtained. Similarly, knowledge of the great scientific test of truth by means of universal consistency enables us to discover truth and detect error, and thus to determine whether the numerous unproved statements and so-called "supernatural truths" offered to mankind under the name of "religion," are really true or false; it also enables us to test the truthfulness of nearly all kinds of abstruse questions both in science and in theology, which are otherwise beyond the reach of the human intellect. We may safely conclude that all those expectations, whether in science or religion, which are not consistent with all known facts, are impossible of attainment, and that all those which are perfectly consistent with those truths may, under suitable conditions, be attained.

Numerous small truths, illustrative of the axiom, that "contradictories cannot co-exist," are well-known. For instance, "two of a trade rarely agree," because their special ideas respecting their calling are often inconsistent with each other. "Oil and water will not mix," because their properties are mutually incompatible. A round cube is a contradiction and cannot be. Black is white, ditto. "Truth and error can never agree," because they are not mutually consistent. Certain pairs of diseases cannot co-exist in the human body because they are incompatible. Religious sects do not unite because they believe contradictory dogmas. Believers in Christ and believers in Mahomet do not agree. Science and theology often fail to harmonise, because some of the ideas they inculcate are inconsistent with each other. Ignorance and intelligence never did agree, and never will, for a similar reason. Things which destroy each other cannot continue together. Friendship and suspicion cannot co-exist. No man can think of two contradictory ideas, or perform two incompatible physical acts at the same time. No man can ever perform a superhuman act. According to Hessel (1829), and subsequently Axel Gadolin (1886), thirty-two classes of symmetry, and thirty-two only, are consistent with that law of whole numbers, which was discovered by Haüy to control the positions of crystal faces (*Nature*, January 30th, 1896, p. 290). The "irrational" in mathematics is a symbol representing a function which cannot be executed. "Root-extraction from -1 is as impossible as the squaring of the circle" (*The Open Court*, No. 414, p. 4584). The principle of non-contradiction operates in human nature as well as in other existences; thus a mason's labourer could hardly be a delicate watchmaker, a strong wrestler or footballer could not successfully perform delicate experiments, a man of coarse ideas would be largely unfit to compose a refined essay, a lover of pleasure can hardly be fond of industry, a reckless youth is unfit to manage a business, an ignorant person is unqualified to teach, etc., etc.

As comparatively few persons are able to clearly comprehend ideas of

complex universal phenomena, such as those of universal law, truth, goodness, etc., the extreme comprehensiveness of the principle of universal consistency renders it very difficult to treat it in a clear manner by means of writing so as to be understood; it requires an educated and trained mind to perceive great and complicated truths, even when they are stated in the simplest and clearest possible language. As children must learn a little language to acquire a little knowledge, so must men learn more language in order to acquire wider knowledge.

The conception of universal consistency in all its grandeur cannot be completely realised by any man, because it infinitely transcends all human power of imagination, and it would still immeasurably transcend it if that power was a million times greater than it is. It would require an ability to conceive the infinitely great; the immeasurably small; the indescribably complex; the capacities of limitless space and of boundless time; the unlimited variety of complexities of infinitely diversified motions, arising from their endless number of combination and infinite multitudes of permutations, both on the large scale and upon the extremely minute one; including the incessant movements of the countless myriads of suns and their systems, and their incessant movements and changes throughout all time and all space; the infinitely diversified and unceasing vibrations of the atoms and molecules of all substances, whether solid, liquid, or gaseous, and those of the omnipresent and limitless ether which pervades all bodies and all space. The human mind shrinks into nothingness in the presence, and by the mere contemplation, of the infinity of universal law, order, and consistency in all its aspects; whether we regard it in the view of its unlimited magnitude, its infinite diversity, or its immeasurable goodness; and the mind becomes lost in a profound feeling of wonder and adoration far exceeding in truth, purity, and holiness, that produced by the contemplation of an imaginary and mere human conception of an anthropomorphic diety, manifesting human attributes, such as is usually offered to mankind as a supreme object of religious worship. By a scientific contemplation of the consistency of the phenomena of the universe, including that of the inexpressibly small as well as the infinitely great, "all things seem to grow in beauty, power, and dimensions. What was grand before becomes majestic, the majestic becomes sublime, and ever expanding and developing, the sublime passes beyond the reach of our faculties and becomes transcendent" (Captain C. E. Dutton). It is not by the uneducated, nor by those whose minds are fixedly saturated with unproved, and therefore, uncertain beliefs, that this magnitude of truthful conception or purity of emotion can be attained, but only by those who have passed through the painful ordeal of continual self-training in truth, and of acquiring sufficient knowledge of the great energies of Nature, and of the order and consistency resulting from their government.

In consequence of the perfect consistency of the universe and of all that is in it, the whole of its phenomena throughout all time and space are necessarily predictable, although we have as yet only attained the ability to

predict a comparatively few, chiefly in the simpler sciences of mechanics, astronomy, physics, and chemistry. Even with the most complex of living structures, viz., that of a living man, there are some phenomena which we know with a degree of probability of millions of millions to one, or with practical certainty, viz., that it will die; whilst there are other human phenomena of all degrees of predictableness; and we reasonably infer that although on account of their great degrees of abstrusity and complexity we are unable to predict them, they are as essentially consistent and predictable as the simpler ones.

8. All Actions Arise From Difference.

Perfect uniformity produces no change; all changes arise from some difference, from some alteration of balance of conditions; for instance, the motion of a stone or the rising of a balloon, is caused by some inequality or difference of pressure upon it; the movement of a piece of iron towards a magnet or the fall of a stone towards the earth, is due to an inequality of the "attractive" influence; the production of a voltaic current arises from a difference of metal, of liquid, or of both, two perfectly similar pieces of the same metal in a uniform liquid do not produce a current; a thermo-electric current is caused by a difference of temperature; the cause of an idea is some cerebral change; a determination of the "will" is due to some inequality of motive, etc. Nearly all the actions of a man are determined by the strongest or most suitable of two or more influences. All movements are determined by differences of molecular or molar motion.

Throughout the universe, stronger influences overcome weaker ones; in mechanics, this is shown by the effect of the greatest weight in a pair of scales; in the tides, the effect of the attraction of the moon is greater than that of the sun; in chemistry, a stronger acid or alkali expels a weaker one; in anatomy, stronger muscles overpower feebler ones; in physiology, more strongly stimulated nerves inhibit the action of less strongly excited ones; in mental action, stronger ideas expel weaker ones and "drive them out of the mind"; and in the act of volition, the stronger stimulant or motive overpowers the weaker ones and determines the course of volition. Great differences often produce either great attractions or great repulsions, both in inanimate substances and in men, incompatible ones repel each other, and cannot co-exist in the same substance. This is shown strongly by magnets and by electrified bodies, and by personal likes and dislikes amongst human beings; also whilst the reed and the asparagus have been observed to prosper together, the flaxplant and the scabiosa arvensis have a manifest antipathy to each other (F. A. Pouchet, M.D., "The Universe" 13th edition, p. 324).

Absolute uniformity does not produce action; and with the exceptions of time and space, there does not appear to exist any perfect uniformity; thus, there is no absolutely straight line, no perfect circle or ellipse,

no absolutely perfect cube or other form, no completely uniform mass of solid liquid, or gas; no perfectly uniform motion or process. There is no mass of substance which is absolutely uniform throughout, or for any period of time, it either differs in composition, structure, temperature, magnetism, or in some other respect; and some one or other of its properties varies with time or locality. Differences usually either increase or diminish by lapse of time; they rarely remain perfectly stationary, and the slightest difference is usually magnified either by time or space, and produces action, in the form of change in other bodies. In accordance with the incessant and universal motion of substances, there is no perfectly statical or absolute uniformity of condition in anything. Lapse of time, difference of locality in space, or unvarying motion, by and in themselves, produce no dynamic effect, simply because time, space, and unvarying motion are perfect uniformities. The molecules of bodies behave like frictionless bodies in a frictionless medium, and the incessant molecular motion of a substance does not necessarily diminish in the least degree by lapse of time or difference of position in space; it is however liable to change, increase, or decrease, by other causes, such as contiguous motions in other bodies, and thus alter the substance in properties, or cause it to contract, disintegrate, decay, etc.

9. Universal Molecular Strain.

All the bodies in space are in a state of gravitational molecular strain tending towards the centres of each other; and those upon the surface of this globe similarly tend towards the centre of the earth and the centres of all other bodies; they are also under the straining influence of magnetism, etc. The upper parts of the iron girders of bridges are in a statical state of compressional strain, and the lower parts of them in that of statical tensional strain. The particles of a rotating millstone are in a state of tensional strain, varying in degree with the velocity of rotation, and when the speed is great the stone sometimes bursts. The diamonds of South Africa (and probably also those of other localities), are well known to be in a high state of tension, ready to burst, in consequence of having passed from the liquid to the solid state whilst under enormous pressure. "It is not uncommon for a diamond to explode after it reaches the surface, and some have been known to burst in the pockets of the miners, or when held in the warm hand. Large crystals are more liable to burst than smaller pieces. Valuable stones have been destroyed in this way." . . . "By way of safeguard against explosion, some dealers imbed large diamonds in raw potatoes to ensure safe transit." "The explosion of diamonds on coming to the surface shows extreme tension. More diamonds are found in fragments than in perfect crystals; and it is noteworthy that although many of these splinters and fragments are derived from the breaking up of a large crystal, yet in no instance have pieces

been found which could be fitted together" (Sir W. Crookes. *Chemical News*, vol. lxxvi, July 2-9, 1897, pp. 3-14). Strain is transmitted from one substance to another by the universal ether, which is itself in a state of strain. In consequence of gravitational attraction and strain, the gaseous particles of the sun are continually approaching each other and evolving heat by the condensation of volume. All men are nearly always in a condition of cerebral and mental strain which presses them to perform their duties, fulfil their responsibilities, pay their debts, support their wives and families, etc.

When substances are in a state of rest, equilibrium, or the statical condition, their strains are balanced, and when in a state of motion, molecular change, activity, or the dynamical condition, the strains are unbalanced, and the substances are usually passing from one state of balanced strain or equilibrium to another. A state of strain precedes the commencement of all motion of masses.

10. Time and Space.

Time is duration, "the continuous, independent, variable"; a perfect uniformity, unlimited in extent, irreplaceable, irrecoverable, and independent of all things, yet all things are related to it; the existence of all bodies and all actions requires time, and causation cannot act without it. Time and space would remain though all material things ceased to exist. Time is one of the simplest of all conditions; it does not occupy space, nor has it position, direction, or shape; take away from it the single quality of uniform continuity and nothing remains; we are at present unable to infer from all our experience and knowledge, or even to imagine any more simple condition, unless it be that of mere existence. In consequence of its absolute uniformity and infinity, we possess no actual fixed period from which to date any event; all our time data, such as sidereal time, determined from the motion of the stars; solar time, ascertained from that of the sun; anno-mundi, anno-domini, etc., are artificial. Time is the most indispensable, comprehensive, and fundamental condition of existence and action of all things; all substances exist and all actions occur in it; all statical and dynamical phenomena require time; every living thing or human being must have time in which to be born, grow, and decay. Without time there cannot be any causation, change, or continuance. "To everything there is a season, and a time to every purpose under heaven" (Ecclesiastes, chap. iii). "Time lost can never be regained"; and all careful persons set a high value upon it. Time is not a material entity, nor an agent, cause, action, or a form of energy, because it has no direct effect upon anything; it is not a property, abstraction, or attribute of anything, because it exists independently of all things; and it cannot be influenced by man or anything in any way. It is imagined to have motion, and for want of more truthful language we say,

"How the time flies"; "time flies, and leaves not a trace behind" (Shakespeare); "the inaudible and voiceless foot of time" (*ibid.*), etc. The idea of time is an inference based upon consciousness, and a perception of succession of events, and cannot be separately conceived without it; we can only indirectly realise the idea of it by means of inference. Time is to all men practically a continuance of sensation, and if the sensation is painful, as in a state of distress, expectation, or suspense, time appears extremely long; but if pleasurable, the time seems to pass quickly; and if sensation and ideation are entirely suspended, as during perfect sleep or unconsciousness, the time is not at all perceived; our senses therefore deceive us, because time always continues, and never ceases. In consequence of the universal property of matter termed "inertia," every mass of matter, whether in a state of rest or motion continues in that state until some cause arises to alter it, and such alteration always requires time. All motion and all velocity occupy time. If there is any phenomenon independent of time it is that of the transmission of gravity, and of the normal undulations of the universal ether (see "Gifford Lectures," 1893, p. 32, by Sir G. G. Stokes), but even that idea is a very doubtful one. Light travels at a rate of about 186,400 miles in a second, a nervous impulse moves about 200 feet per second; even thought is not instantaneous, the formation of a simple idea, such as "copper is red," requires about one twenty-fifth part of a second. It takes time to form ideas, much time to indoctrinate a generation with new truths, and a long time to eradicate fixed notions; the discovery of new knowledge is usually also a very tedious operation. The process of human civilisation requires a very long time, and the formation of the heavenly bodies an immeasurable period of duration. The value of a man is often indicated by the degree of importance he places on time.

Time is the most fundamental element and condition in the actions of all bodies, whether animate or inanimate, tangible solids, or the intangible ether. The entire subject of human temptation is related to the condition, time; in human actions and motives, both men and women, will for the sake of small immediate pleasure, run the risk of great future pain, largely because immediate influences are stronger than remote ones; similarly, a thief, being more strongly influenced by the immediate prospect of gain than by the distant one of punishment, yields to the temptation to steal. In the infinity of time, "a thousand years are as but one day":

> "Oh who can strive
> To comprehend the vast, the awful truth,
> Of the eternity that hath gone by,
> And not recoil from the dismaying sense
> Of human impotence?"
>
> —*Henry Kirke White.*

> "For who can add to what has neither sum,
> Nor bound, nor source, nor estimate, nor end."
>
> —*Ibid.*

Time is in itself the most important of all conditions, because the existence of the universe, of all bodies, whether animate or inanimate, and all their phenomena depend upon it. It is also the most important to us because our very existence, and all our actions require time; we can do nothing without it; we must have time to move, to sleep, to eat, to drink, to work, to play, to think. The gain or loss, use or misuse of time, determines our success or failure in life, our happiness or misery in old age; time lost is gone for ever; the moral qualities of punctuality and promptitude in all our actions are dependent on time. The duration of a single human life is altogether too short to accomplish all the good deeds which worthy men wish to perform, and the most industrious of men are compelled to leave many duties undone through insufficiency of time. Time is an important element in the preservation of human life; many diseases are curable if "taken in time"; great changes which occur in short periods of time, such as volcanic outbursts, earthquakes, avalanches, tidal waves, epidemics, revolutions, etc., are often very destructive, unless they can be provided for beforehand or regulated when they occur. The feeblest cause acting through infinite time can produce an infinitely great effect.

Space is unlimited extension, a reality, the simplest of all realities except time, a perfect uniformity, unconditioned by all things except time; we can imagine time to exist without space, but not space without time; space can exist without matter but not matter without space; space exists independent of all material substances, and therefore of all influence of the properties and relations of them. Space is the region of the continuous and incessant movements of the universal ether. There is space for everything, and everything except time requires it; similarly to the invisible ether, space occupies all substances, and they occupy it. Space, like time, is not a cause, but is an indispensable condition of all causative action; all actions must be caused and occur in it. It is not a material entity, nor an agent, nor form of energy; nor is it an action, property, or attribute of anything, because it exists independently of all energy and of all material things. Neither time nor space are direct perceptions, nor immediately affect either of our senses, we infer them, nevertheless we cannot exist without them. Time and space are the womb of all things, everything exists and happens in them; they are the silent highway of all evolution, civilisation, change, and decay. Space, being continuous uniform extension, may be hypothetically viewed as time *plus* extension. Time and space have no differences in their different parts. The properties and relations of time and space constitute the basis of mathematics, geometry, mechanics, and physics. As all substances are compressible, distance apart in space is a necessary condition of their acting upon each other (J. Bayma, "Molecular Mechanics," 1866); without time and space we could have no physics, chemistry, or psychology. The most fundamental explanations and bonds of co-ordination of things lie, as far as we know, in the ideas of time, space, and motion, and it has been suggested

that space is a form of time. We cannot add to, or subtract from, infinite time or space. Even the publication of truth is subject to suitable time and place. The statement "in Him we live and move and have our being," is perfectly applicable to time and space, and is consistent with some of the definitions attempted to be given of an universal Deity. There can be no motion without time and space. Astronomy proves the immensity of space; geology and the evolution of man indicate that of time; and omnipotent energy that of universal motion. Time, space, and energy, are each continuous and indestructible; and continuity is their essential attribute, for if we take that away, no idea remains.

Volumes might be filled with illustrations of the great importance of time and space to mankind, showing that all human actions, whether physical or moral are influenced by those conditions. Time, space, matter, and motion, and their relations to number, weight, and measure, are the foundations of all accurate science; we have no idea of any substance or action unconditioned by time and space. A very large proportion of advance in civilisation has been effected by arrangements and contrivances for diminishing loss of time and abbreviating space; every railway, steam-engine, tramway, telegraph, telephone, etc., etc., has contributed towards this effect. Famine, wars, personal quarrels, and a multitude of other evils have been averted, an immense amount of industry, trade, and friendship developed, by increasing the speed of travel, and of transmission of goods and of thoughts, through the saving of time and of space by means of the steam-engine and telegraph. It is time and space which imparts importance to transport and its cost; previous to the construction of the Transcaucasian railway it was cheaper to convey lamp-oil 8000 miles from Ohio to Tiflis than from Baku only 350 miles distant where millions of gallons of the crude oil were constantly running to waste. The construction of the St. Gothard tunnel has so shortened the time and the distance of transport between Italy and more northern countries that large quantities of perishable food are now brought through it to England. The use of the steam-engine, and machinery in cotton mills has very greatly diminished the time, the space, and the cost of production of clothing. The importance of space and time to mankind is constantly being illustrated by the crowded streets of our cities, by the high price of building land in cities, and by the vast number of persons who travel by the quickest conveyances. Futher illustrations would be superfluous, because every intelligent person is familiar with them.

11. Universality of Causation.

All things are caused, and must be as they are under the present conditions; there must be "an egg before an eagle." Causation is inseparably related to existence, time, space, and the condition of continuity; it is a fundamental principle lying at the basis of all change in dead and living

things; it operates, so far as we can infer, through all time and all space, and the statements that "whatever is must be," and "necessity knows no higher law," are implicitly contained in it. The fact that whatever is must be until something changes it, is essentially related to the first law of motion, viz., that "a body in a state of rest or motion must continue in that state until some cause arises to alter it"; and this indicates that the origin of all action in dead and living things is some kind of motion. A "first cause of all things" is at present unknown, and is likely to remain so, because so far as we know, causation is endless succession, with no beginning. The real cause of all the active properties of material substances is motion, either of atoms, molecules, or masses. The discovery of profound causes has hitherto revealed still more profound ones; but there must be a limit even to profundity of causation. One writer states that:—"All causation proceeds from intelligent volition." "A cause without consciousness would sleep for ever in potentiality." "The consummation of the causal act implies the exertion of will" (A. Winchell, LL.D., "Science and Religion" pp. 81, 85, 97). According to the Reverend James Tait, "the sum total of the things presented in the Universe is the gigantic effort of a Spirit to reveal Himself," ("Mind in Matter" p. 5); but there are multitudes of phenomena, the immediate causes of which are not "volition," "consciousness," or spiritual influence. And further it is said that:—"Divine agency" is "the true name of all energy." "The foundation of all energy is will" (A. Winchell, LL.D., "Science and Religion" pp. 67, 97, 107, 234, 235, 303). The remarks already made respecting our inability to arrive at the first causes of things apply to these quotations; we know nothing at present respecting the original source of the energy of the universe.

Epicurus 371-270 B.C., maintained that everything came from natural causes. The searcher for first causes might ask, who made the maker of the universe? Supernatural powers are inconsistent with universal natural causation; if natural causation was interfered with by some arbitrary will, we could never be sure that the same cause acting under the same conditions would always produce the same effects; and it would render human life unsafe.

The fundamental idea pervading all scientific views of physical, mental, and moral actions, is that of causation. According to it, whatever occurs under the given conditions must be—for instance, starvation forces a man to steal, and our regard for the safety of our property compels us to punish him. Causation operates whether it agrees with our ideas of justice or not, for example, earthquakes, and other great disasters occur regardless of our supposed merits and our claims; if the number of paupers around us was doubled, we should have to pay double poors-rate, whether we helped to produce the additional pauperism or not. In all human actions, physical or mental, causation operates as certainly as in the simpler phenomena of mechanics or physics; thus, "history makes men wise; poetry, witty; mathematics, subtle; natural philosophy, deep; morals,

grave; logic and rhetoric, able to contend" (Lord Bacon). "Sow an act, and you reap a habit; sow a habit, and you reap a character; sow a character, and you reap a destiny" (Boardman). We all do as we must, some to gain a million, others to earn a crust.

"Our deeds still travel with us from afar,
And what we have been makes us what we are."

"With equal pace, impartial fate
Knocks at the palace as the cottage gate."
—*Francis.*

"Just as the flowers must bloom where fitness is,
And as the sun must shine where there's no shade,
So I must struggle in environments
Which force men to, because things are so made."

"Men talk of fate as if a man could sit
Unmoved by action of eternal law;
But this delusion science drives away
And shows it's only a religious saw."
—*The Open Court*, No. 478, p. 5101.

"Genius acts less because it would than because it must" (Hagen), fanaticism, ditto. Every man does as he is compelled, if he did otherwise it would be a miracle; but there are plenty of cases in which a very slight cause or condition disturbs the balance and determines the energy within him to act strongly in one or another direction. Nothing can cause itself or directly act upon itself although it often appears to do so; everything, however, being in a state of molecular motion, contains within itself potential energy, which may under suitable, and often under imperceptible change of conditions, be liberated, and this has given rise to the erroneous belief that intelligent will is a real source of power.

Any phenomenon which follows another in point of time cannot be its cause; all motion is due to some prior motion. All actions arise from difference; a cause and its effect are never entirely alike, they all differ in time, and often in other respects. States of matter act as causes. Invariable means must always be employed in order to secure invariable ends; every effect has an appropriate cause, and in the absence of such cause, the effect does not occur. From nothing, nothing comes; and from everything, everything proceeds. Nothing comes by chance, though in many cases this is difficult to perceive; and as all things exist and act in accordance with law, it necessarily follows that "whatever is must be"; this, however, does not include fatalism, or action independently of all conditions, nor exclude the conventional "freedom" of thought and action of man, nor his personal responsibility, as will subsequently be shown (see sections 47, 49). No one ever did that which he could not; any effect said to arise without a real and sufficient cause would be a creation of

energy, and be inconsistent with law and with truth. But real causation is something more than invariably recurring sequence, it is continuity of phenomena; it is also a change, either of molecular or molar motion, attended by transference and sometimes transformation of energy.

In some cases a single cause is followed by only a single effect, in others by many; and in a large number of instances, numerous causes are necessary to produce a single effect :—

> "Ah, what a wondrous thing it is
> To note how many wheels of toil
> One thought, one word can set in motion !
> There's not a ship that sails the ocean,
> But every climate, every soil,
> Must bring its tribute, great or small,
> And help to build the wooden wall."
>
> —*Longfellow.*

In various cases where a number of distinct causes and conditions are required to produce a given effect, no effect at all occurs until the whole of the causes and conditions are present; the production of sleep, and the communication of contagious disease, are largely instances of this kind.

The relation of cause to effect applies not only to all dead substances, but to all living structures; to the invisible molecules of gases as well as to the great globes of the universe; to man's mental and moral actions as well as to his physical ones; to statical as well as to dynamical phenomena. And as it is one of the chief rules of morality to proportion the fixity of our belief to the strength of the evidence, we are morally bound to believe in the universality of this great governing principle, and to disbelieve in so-called "supernatural" phenomena. Although there are natural causes for all things, in many cases we have not the ability to find them, but we logically and justifiably infer them.

As a chain is only as strong as its weakest link, so in a series of successive dependent phenomena the final effect is only certain provided all the intervening ones are sure. The final effect is not, however, rendered less certain by mere greatness of number of the intermediate ones, nor by the length of time occurring between them; thus, the last carriage of a railway train is as certainly pulled as the first one by the locomotive in front; and we are all of us as certainly the children of "Adam" as of our immediate progenitors. The propagation of the light of the sun is as certain as that of a neighbouring lamp although the distances are unequally remote. The stored-up energy of a substance is not diminished by mere lapse of time, as in the case of gunpowder. Remote causes are often as certain of producing their effects as immediate ones; the excesses of youth are not prevented from producing their effects in old age simply because there is a long period of time and a multitude of events between them. The present art of navigation of ships is affected by the discovery of magnetism made many centuries ago; and the present price of copper is influenced by

Faraday's discovery of dynamo-electricity in the year 1831, by creating a demand for that metal for the purposes of electric lighting, etc. "Whilst man struggles for his own ends, he unconsciously influences his own time and his own people for all futurity" (*The Open Court*, No. 45, p. 1085); the influence of Mahomet, Jesus Christ, Shakespeare, and Newton, are felt even now. We all live, and are indebted for our enjoyments and happiness to the labours of past generations of men. "The sins of the parents are visited upon the children, even unto the third generation." Each age gives birth to the next throughout all time. Small exciting causes may lead to great effects; thus, "paper and ink have made all men think." A mere look will excite the strongest volitions; it may lead to the commission of murder, adultery, etc.; but in such cases the real causes are not the volitions, but the stored-up energy in the human body and brain.

In consequence of the great truth that "every action requires time," "effects often lag behind their causes," and in some cases during a long period, thus the greatest heat of summer usually occurs several weeks after midsummer, the physical and mental effects of early mistakes are often not fully experienced until after many years; the decline of a large institution or of a nation follows in some cases a very long period of time after that of action of the chief causes which produced it. Absence of visible connection does not prevent the influence of causation; this earth is as certainly tied to the sun by the power of gravitation, as if the two were united together by a visible chain.

Practical belief in the universality of causation has a very valuable moral effect upon the human judgment, because whilst it makes a man more tolerant of the defects of his fellowmen, it diminishes reckless and wilful violations of law; it will also produce by its gradual extension other great social, moral, and religious effects, of which we have at present but little conception; it does not decrease our sense of responsibility, as some persons think, but really increases it, because it proves to men that they cannot escape from the consequences of their acts. Our personal consequences depend upon our actions and those of our environment. Men are much better pacified when they have done wrong, by telling them that they did as they must under the circumstances, than by unconditionally blaming them. Belief in universal causation makes a man a much more reasonable being; it imparts fortitude under trial, it diminishes complaints, etc., it acts upon the human mind somewhat like the fly-wheel does upon the motion of a steam engine. The truest charity is to always remember that all men do as they must.

> "Happy the man, who, studying Nature's laws,
> Through known effects can trace the secret cause—
> His mind, possessing in a quiet state,
> Fearless of fortune and resigned to fate."
>
> —*Dryden.*

Some persons appear to doubt the complete uniformity of Nature in

universal causation, thus Bishop Temple states, "I am constrained to believe that two and two are four and not five," but "I am not constrained to believe that if one event is followed by another a great many times it will be so followed always" ("The Relations between Religion and Science," 1885, p. 18). In reference to this statement it may be remarked:—(1) that many theological persons do not "feel constrained to believe" any scientific ideas which appear to contradict their fixed doctrinal beliefs; (2) it requires much more scientific experience than such persons usually have had to become fully convinced of the universality of natural causation; and (3) in every one of the millions of millions (or more) of instances yet known, the same cause, acting under the same conditions, has always produced the same effects, the probability therefore is more than millions of millions to one that it will do so in the next instance, and scientific men are therefore "constrained to believe" in the law as firmly as they believe that "two and two are four." The same author has further stated:—"Science has not proved and cannot prove that the scientific domain is co-extensive with Nature itself" (*ibid.*, p. 218). "Science is not able, and from the nature of the case never will be able to prove that the range of fixed law is universal, and that the will never does interfere to vary the actions from what without the will they would have been. Science will never be able to prove this, because it could not be proved except by a universal induction, and a universal induction is impossible. At present there is no approximation to such proof" (*ibid.*, p. 91). Fortunately, the evidence in support of the uniformity of Nature, and the universality of causation, continuity, and other great truths of science, is not limited to "induction" from experience, though even that is vast. The universality and uniformity of natural causation is largely proved by means of prediction or deductive inference; if we predict the future occurrence of eclipses, transits, etc., of the sun and planets, and they actually occur at the predicted minute, years to come; and if we foretell the existence of unobserved heavenly bodies, their distances and magnitudes, and the prophecies are verified; and if we further prophesy the existence of various undiscovered metals and gases, together with their properties, and these are subsequently discovered, and their properties verified; and if we also announce the possibility of forming numerous alcohols and their compounds, and state their properties beforehand, and these bodies are subsequently formed, and their properties found to agree;—we legitimately and logically infer that the evidence is complete for the purpose, and that the laws upon which the predictions were based are perfectly reliable. The whole of this and vastly more has been done, and scientific men are constantly and successfully predicting new substances and phenomena by means of fundamental truths, and the great success of the predictions proves the certainty of the truths and the invariable uniformity of Nature. The same conclusion is in all cases confirmed by induction from a vast number and variety of particular instances, but of course it cannot be completely proved in every possible case by induction alone, because the labour

and time required would be too great, or the necessary conditions impossible. "That the scientific domain is co-extensive with Nature itself," and that supernatural interferences by means of the "human will and the miraculous element in Revelation" (*ibid.*, p. 226), do not really "interfere with the uniformity of Nature," is further proved by showing that supernatural influences do not exist (see section 4). There is rational scepticism and irrational scepticism; those who are not satisfied with a degree of probability amounting to more than millions of millions to one are not very reasonable.

Persons who are not constrained to believe in a universal scientific principle, until they know that it has been verified by induction in every possible instance, cannot consistently believe that they are certain to die, or that the sun will rise to-morrow, until those events have occurred, and can never be convinced by means of evidence. It is in perfect accordance with physiological and psychological facts that many devout persons, insufficiently educated in science, prefer faith without evidence, to faith with the most extensive demonstration, largely because they cannot rid their brains of preconceived untruthful impressions and the strong personal desires upon which these impressions depend. Taken altogether, the want of belief by such persons in the great truths of science is only a repetition of former similar cases, and scientific men have only to wait patiently, and at its own proper time the unbelief will disappear as it has in many previous instances. It is "religious" persons and unscientific ones, who most disbelieve in omnipotent power and immutable law. We know that in different cases scientific prognostications possess all degrees of certainty, ranging from mere guesses such as some of those which relate to the weather, up to the highly certain ones of eclipses of the sun by the moon; and those who will not believe in the latter until the events have actually occurred, must, as Locke said, "sit still and perish." Theology opposing science is much like Canute commanding the tide to stop.

According to the same writer:—"In mathematics we have truths which we cannot but accept as universal and necessary; in physics we have no such truths" (*ibid.*, p. 18); unfortunately this is contradicted by the fact that in physics the same cause acting under the same conditions always produces the same effects with mathematical certainty, for instance, the physical phenomena of gravitation are universal and as sure as the results of mathematical calculation; indeed, physics has been called "a branch of mathematics," and even mathematical calculations must conform to physical facts, and are only certain provided the latter are sure. If we cannot accept physical truths as necessary it is often because we do not sufficiently understand them. As we believe in all mathematical conclusions because the fundamental ideas of that science are true, so also we believe in certain physical conclusions because the fundamental ideas of physics are true. The same author further states that there are "two classes of facts excepted" from the uniformity of Nature, viz., "the act of the human will and the miraculous element in Revelation, both of them

instances of one thing, namely, the interference of the moral with the physical" (*ibid.*, p. 226); with regard to this venturesome statement, it is only apparently, but not really true; so far as scientific experience extends there is no natural effect without a natural cause, and there exists no proper and sufficient evidence that either the phenomena of the "will" or those of an occult "miraculous element" are really excepted from the uniformity of Nature, or that they are really due to any other than natural causes. It is well-known that many devout persons prefer to believe in the action of supernatural ones which cannot be proved, either by the senses or the intellect, rather than in natural ones which have been proved by both; they "strain at a gnat and swallow a camel." History has shown that the usual course in such cases is:—At first the great truths of science are asserted to be false and contradicted by scripture; next, that they were known to the ancients; and finally, that they only confirm what scripture has already said, and so the unbelief and opposition ceases. Carlyle, speaking to a friend respecting Dean Stanley, is reported to have said:—"There goes our friend the Dean, boring holes in the bottom of the good ship Church of England, and doesn't know it" (Salter, "Ethical Religion," 1889, p. 203).

The late Cardinal Newman fell into a similar error respecting the nature of causation; he said "when we come to the question of cause, then we have no experience of any cause but Will; . . . and the invariableness of law depends upon the unchangeableness of that Will; and as a cause implies a will, so order implies a purpose." "The agency then which has kept up, and keeps up, the general laws of Nature . . . must be Mind, and nothing else" ("A Grammar of Assent," 1870, p. 69); "I consider a cause to be an effective will" (*ibid.*, p. 66); judging from these very erroneous remarks he appears to have been entirely unacquainted with the great scientific truth of universal molecular motion, which acts as a real cause in all bodies, and entirely independent of will in all inanimate ones, and which according to all scientific experience and knowledge, is capable of maintaining all natural phenomena. Does "will" drive all our steam-engines? As theological writers usually expect the fullest evidence in support of scientific conclusions, it would only be fair to expect sufficient evidence in support of theological ones, but the latter is entirely excluded by the demoralising practice of demanding unlimited belief without evidence.

The deficiency of knowledge of the universality of the great law of causation, or the equally extensive ignoring of it by the spiritual teachers of mankind, is a serious matter, because it results in extensive diffusion and perpetuation of error or real irreligion and a habit of untruthfulness amongst the masses, inducing mankind to believe in acts of creation of power, and of supernatural agency, without proper and sufficient evidence, and in contradiction to scientific truths. Substituting an arbitrary will for unerring energy and law encourages lawlessness. "The easy, flippant way in which certain ministers of the gospel accuse the Creator of injustice is very much like blasphemy. When lightning strikes a church and kills

fifteen of the worshippers inside, as it recently did, we are not permitted to call this a divine punishment for church-going, but when it strikes a steam-boat carrying excursionists on Sunday we are taught that this is a punishment for patronising a steam-boat rather than a church. 'Are we then to consider this disaster as a judgment of God,' said the preacher. 'I think we must. Some will say that it was the natural result of the commotion of the elements. But who controls the elements?' This was conclusive. God controls the elements was the answer suggested by the question, but that they are controlled by laws fixed and immutable was not shown to the congregation." "In cases of sudden and mysterious death, 'died by the visitation of God' has been the verdict in England for hundreds of years, and the form of it prevails to this day, although the men who render the verdict have ceased to believe it" (*The Open Court*, No. 153, p. 2428). According to J. J. Murphy:—"Burning deserts and frozen forests" . . . "are no part of the necessary order of things" ("Scientific Bases of Faith," 1873, p. 232)—but how can this assertion be proved? "It is an undoubted principle in the Catholic schools that every reality in existence, substance or accident, from the greatest to the least, is produced by God immediately; that is, not by means of any other agent, substance or accident, 'force' or motion, which He may have produced already, but as the direct and immediate term of His own divine activity" (W. M'Donald, *The Irish Ecclesiastical Record*, October, 1897, pp. 305-306). This sweeping statement appears to contradict the great principles of causation, and so does the following one. "It is a matter of faith with Catholics that miracles never cease in the Church" (Cardinal Newman, "A Grammar of Assent," 1870, p. 193). Such unprovable assertions are unworthy of scientific refutation.

It is not truth, reason, demonstration, nor what we consider to be "morally right," but immediate necessity, *i.e.*, direct causation, which essentially determines the beliefs and actions of the great mass of mankind; and in a great many cases causation operates in the form of personal blind desires, *i.e.*, persons believe and act, not according to reason or evidence, but to their desires; they wish to believe in the objects of their wishes, and they do so. The idea of universal causation and of the constancy of Nature, although not the most popular, is, however, one of the most important of our beliefs. Mankind are governed more by material causes than by mental ones, more by feeling than by intellect, and more by material necessity than by either. Causation acts in such an order that we must first satisfy our bodies by means of food, air, a dwelling, fire, and clothing; then our animal desires, feelings, and emotions; and lastly, our intellect and reason, consequently the last is extensively neglected. Even the determination of human actions by mere desire or feeling is evidence of natural causation; and it is manifest that all education is dependent upon a practical belief in the law of universal causation, otherwise we could not expect any certain effect from personal training.

The very common circumstance that great effects follow immediately upon small or unapparent changes, has often been a great stumbling-block to unscientific minds, and has caused such persons to refer them to occult or supernatural influences. Such phenomena are, however, frequently very simple, and in many cases are due to accumulated energy, which may be suddenly released by some small or unapparent circumstance; thus the smallest spark will suddenly set free the energy of the greatest mass of gunpowder; a minute defect in an embankment may suddenly liberate the entire contents of a lake; an invisible defect in a steam-boiler or flywheel may enable it to suddenly burst; a mere wish or volition may excite violent passion or change a man's course in life; the effects of a single mistake in youth may produce poverty in old age; the extremely feeble power of gravitation gives rise to earthquakes, floods, and other great terrestrial changes.

12. The Principle of Universal Continuity.

The principle of continuity is universal. Time is perfectly continuous, so also is space, and apparently the universal ether which fills it; time is continuous sequence, space is continuous extension, and the ether is continuous vibration; time is the simplest and most fundamental form of continuity. The idea of continuity is that of universal connection, and is more comprehensive than those of time, space, energy, or causation, because they all require it. All causes merge into their effects—

> Neither in time nor space is there vacuity,
> Nor in the endless chain of continuity.

Universal causation is continuous throughout time and space; all bodies and actions are connected together by their causes and effects, and all the phenomena of the universe are inseparably united together in one systematic whole, both in time and space, by the bond of continuity. Things go on and on, and in the infinities of time, space, motion, and evolution, for ever on. All things are related to all, both in parallel and series; at the same instant of time no one thing can change without sooner or later affecting the whole. The past has been tied to the present, and the present is bound to the future by the continuity of cause and effect; the existence and actions of all things are continuous in series from minute to minute, and age to age, throughout all time. Continuity of succession is an essential condition in the operation of causes, and without it there could be no evolution of worlds in space, of man, morals, or civilisation. Child and man are the same chain, but not the same link. As continuity makes all the phenomena of the universe a connected whole or system, it is the essential foundation of all history—

"From Nature's chain whatever link you strike,
Tenth or tenth-thousandth, breaks the chain alike.
The least confusion but in one, not all
That system only, but the whole must fall.
Let earth unbalanced from her orbit fly,
Planets and suns run lawless through the sky."
—*Pope.*

"All are but parts of one tremendous whole,
Whose body Nature is, and God the soul."
—*Ibid.*

The universality of continuity is shown by the perfect conservation of matter and energy; in the former, by the invariably undiminished existence of mass under all known conditions; and in the latter, by the perfectly undecreased amount of cosmic energy by transformation or by lapse of time. The perfect continuity of matter and energy, and of the union of cause with effect, ensures the stability of the universe and the safety of human life. The principle of continuity of phenomena is illustrated by all kinds of history—by that of the universe, and of all things in it. "The history of eternity is written in every second of time, and the state of the universe in every point of space" (W. K. Clifford). The present state of the universe is united by continuity to all its past states, potentially contains all its future ones, and implicitly their history; the universe is therefore its own record and prophet, and man is only its interpreter. Astronomy has demonstrated that what has been and what will be are capable of being inferred from what is. As every single particle of matter is united to every other particle through the bonds of causation and continuity, it is inseparably related to the whole of its past and future history in time and space. Each separate substance and living thing shows more or less evidence of its past history, and if we had sufficient scientific knowledge and ability we would be able to discern it; thus the history of society is indicated by the relics discovered of its former habits and customs, and by the inferences we may logically draw from them: that of man by his vestigial and degenerated organs. That of a drunkard is shown in his features; that of a water-worn pebble by its roundness and smoothness. What a man is, in comparison with what he was, discloses more or less of his history. The present is the link between the future and the past, and history is a succession of events never to be exactly repeated—

"The world goes up, and the world goes down,
And the sunshine follows the rain;
And yesterday's sneer, and yesterday's frown,
Can never come over again."
—*C. Kingsley.*

"Whatever hath been written shall remain,
Nor be erased, nor written o'er again;

The unwritten only still belongs to thee:
Take heed, and ponder well what that shall be."
—*Longfellow.*

The most important phenomena are not the most violent, but those of longest continuance; thus, the never-ceasing washing away of the rocks and mountains into the seas by the influence of the atmosphere and rain, and the slow but incessant lifting of chains of mountains by the continuous pressure at the bottoms of the oceans are more important phenomena than the outbursts of volcanoes or the occurrence of earthquakes. It is by the gradual and almost incessant assimilation of carbonic acid from the atmosphere during daylight that all the great forests of trees and the vast deposits of coal have been formed, and the energy of the sun stored up in them. "Time works wonders." An excessively small action or force continued through immense time or space is capable of producing an extremely great amount of effect. Violent phenomena are usually only results of pent-up, accumulated energy, due to long-continued and feeble influences. It is not scientific but unscientific persons who are the most attracted by violent actions, by noise, drums, shouts, loud speaking, etc., and who most neglect quiet, continuous exertions; they applaud a Luther whilst they condemn a Galileo and neglect a Newton, and their opinions are continually being swept away by the never-ceasing but quiet progress of scientific discovery. Luther's belief in witchcraft and in a devil has thus disappeared.

A great variety of illustrations might be given of the principle of continuity if it were necessary. Thus each leaf of a tree is connected in series to the trunk, the branch, and the particular twig which supports it; and less directly, in parallel to all the other leaves of the tree; and still less directly, though equally certain, to all surrounding nature. Each man is related by continuity in series to all his progenitors and to his offspring, and less directly in parallel to all mankind, and through the continuous ether to the whole of the universe. The principle of continuity connects minerals with plants, and plants with animals, in a variety of ways; thus plants are formed from mineral matter, and animals from plant-substance. The power of interbreeding is not confined to animals, but extends to vegetables and minerals; similar species of animals interbreed with each other, similar kinds of trees may be grafted upon each other successfully, and mixed crystals may be formed from mixed solutions of isomorphous substances belonging to the same axial system. There are also twin animals, twin leaves as in the calyx leaves of the poppy, and "twin crystals," thus showing continuity of property running through the mineral, vegetable, and animal kingdoms. Research yields discovery; discovery is the basis of invention, invention evolves new manufactures and processes. These give rise to trade, and trade is rewarded by money; and thus the principle of continuity links the scientific investigator to the tradesman, and makes the possession and increase of the necessities, comforts, and

luxuries of mankind dependent upon the continuous discovery of pure truth. Trade depends upon science for knowledge, and science depends upon trade for money, and the entire progress of civilisation is a stream of continuity.

13. The Principle of Universal Evolution.

Evolution is inseparable from continuity, and consists of a long series of successive and connected acts of causation, "a procession of events," in the same body or collection of bodies, for instance, in a man or in a nation, and is a term usually applied to processes of increasing complexity, such as growth and progress, not to those of decreasing complexity, such as decay and decomposition, which often accompany them. In the ordinary sense, evolution is attended by differentiation, *i.e.*, a change in which a single cause or group of causes produces a number of different and more or less simultaneous effects, each of which in its turn acts as a cause, and similarly produces several further differentiated effects. Differentiation may be likened to the division of the trunk of a tree into branches, the branches into twigs, the twigs into leaves, and the leaves into separate parts and fibres; thus the roots, branches, and leaves of trees grow in the directions in which they can obtain the largest amount of nutriment and energy; the roots stretch out and divide towards the moist and most manured parts of the soil, and the branches and twigs in the directions of the greatest light and heat; and in this manner the general effect called "differentiation" is produced. Plants grow, metals electro-deposit, crystals accrete, and men think, act, and move in the lines of least resistance or of greatest assistance. The shapes of various zoophytes and of certain electro-deposited metals, and of some kinds of carbon, very closely resemble those of plants; thus we obtain coral growths, copper moss, silver moss, carbon wool, etc. Differentiation is evidently due to natural energies acting according to definite laws.

Uniform structures become non-uniform ones when they are subjected during their accretion or growth to heterogeneous conditions, and structures which are but faintly and imperceptibly different at the outset frequently become widely different during their growth; thus the ova of different animals are not perceptibly different in the very earliest stages of their existence, but become widely so during growth to maturity. As aggregation proceeds, differentiation increases. Complex organs and tissues are evolved out of simpler ones, bone is preceded by cartilage, and cartilage by apparently homogeneous jelly. Similarly two straight lines, side by side, which are only imperceptibly non-parallel at their commencement, become widely divergent after proceeding a long distance; two pendulums also, the periods of vibration of which are only imperceptibly different at the end of a minute, become conspicuously different at the end of a week. It is by difference of internal and external conditions that

different cells and groups of cells grow to be different members of a living organism, and perform different functions. In the very lowest animals the same structure performs all functions, and therefore each part is equally complex, but in the higher ones each different kind of work is performed by a different organ, and the structure of each organ is more simple. (See *Proceedings of the Royal Society*, May 10, 1899, p. 38. Dr. Burdon Sanderson.) These facts support the view that the different functions, such as contractility and irritability, are due to particular species of molecular motion, which cause different organs to differentiate out of the original structure.

All evolution of living things depends upon the principles of causation, continuity, universality of motion, action and reaction, etc., the molecular movements of an organism and of its environment act and react upon each other as cause and effect in continuous succession, the result being differentiation and increase of complexity of the plant or animal, of the body politic, the nation, mankind. "Given a body which, although a minute speck, contains billions of molecules performing complicated movements of immense rapidity, and sensitive in an inconceivable degree to the play of vibrations impinging upon them at the rate of hundreds of trillions per second would not the marvel be if these quivering particles of the structure shaken by energies within, and by still more potent energies without, did not undergo continuous redistribution?" (E. Clodd, "The Story of Creation," 1890, pp. 162, 163). By shaking a mixture of insoluble powders in water they differentiate, the heaviest settle to the bottom.

It has been suggested that the material universe has been evolved out of the universal ether which pervades all bodies and all space, and it may be further imagined that the ether may have been evolved out of space, and space out of time, but such ideas are only scientifically useful as temporary hypotheses to be examined or tested. Little things are evolved into big ones, simple into complex ones, and the reverse, and small influences produce great effects, if sufficient time and space are allowed; with time to expand and space in which to move, the vibrations of a molecule may be transmitted throughout the known universe. Small molecular influences may in time move the great globes in space; thus gravity, by far the feeblest of all known energies, directs the motions of the solar and stellar systems. Liquids may be evolved out of solids, and gases out of liquids, and we can hypothetically imagine by extending the analogy, that the ether and its universal motion may during sufficient time have been evolved out of gas until it has filled all space; and conversely, that by a process of condensation gas has been produced out of the ether, and liquids and solids out of the gas. Our knowledge of the great principle of evolution in living creatures was itself largely evolved by the labours of De Maillet, Robinet, Buffon, Lamarck, Geoffrey St. Hiliare, Naudin, Herder, ("The Precursor of Darwin," Max Muller, "Natural Religion," 1892, p. 260), Darwin, Wallace, and Spencer. The vibrations of light falling upon living eyes develop vision; those of sound impinging upon living ears evolve

hearing ; those of odours evolve the power of scent ; and of flavours produce taste, etc., thus, a particular kind of crab Ethusa granulata, has well-developed eyes when living near the surface of the sea, but when living at a depth of 500-700 fathoms, it has no eyes and is apparently blind (Sir Wyville Thomson). A great variety of such examples might be adduced. The universe has evolved cerebral matter and intelligence, not the reverse.

Evolution, in its ordinary meaning, is essentially dependent upon a well-known general property of substances, viz., that if we apply a single form of energy to a body, even to one of the simplest kind, a number of effects are produced, and this is probably due to the great degree of molecular complexity of substances. Thus, if we apply heat to a piece of iron, a variety of changes occur in it, until at a white heat it emits rays of light of many hundreds of different degrees of refrangibility. The simple mechanical power of a steam-engine, applied to a dynamo, produces not only an electric current, but a considerable proportion of heat. An electric current passed through an electric lamp produces heat as well as light. Of the chemical energy of a given quantity of coal burned under the boiler of a steam-engine, only about thirteen per cent. appears as available mechanical energy, the remainder producing other effects. In the incandescent electric lamp, less than one per cent. of the energy of the coals appears as light, the remaining ninety-nine per cent. being lost on the way by producing other phenomena.

" Heat or pressure applied to a piece of steel alters its length, breadth, thickness, molecular arrangements, specific gravity, cohesive power, adhesion to liquids, elasticity, temperature, specific heat, latent heat, thermic conductivity, thermo-electric power, electric conduction-resistance, magnetic capacity, chemical action, voltaic action, and a number of other properties simultaneously."

In a paper on " The Molecular movements and Magnetic changes in Iron at different temperatures " (*Philosophical Magazine*, September 1870), I have remarked, " The changes produced by heat in even so apparently simple a substance as iron were so numerous in some of the experiments as to produce the impression that the metal was endowed with vitality." " These simultaneous and varied changes of properties in a single elementary substance by a single cause is a general attribute of matter, and iron and the magnetic metals generally are only conspicuous instances of it amongst such substances, probably because they possess the greatest number of molecules in a given space, and have their properties thereby condensed." Similarly—" the least ray of light falling upon a coloured or a dark body, must produce some effect ; it usually raises its temperature, and the effect is more or less different in every different substance at every different temperature, simply because each substance becomes more or less a different one under those conditions. In a vacuum it repels bodies, in black substances it produces heat, in selenium it alters the electric conductivity, in salts of silver and many other chemical compounds, it changes

the chemical state, and so on" ("Art of Scientific Discovery," 1878, pp. 33, 34). Whilst in many instances, a single cause determines a large number of effects, in other cases, many causes conspire to produce a single effect; for instance, a state of health in the human body depends upon the united influence of a very large number of causes and conditions, and the state of sleep can only occur when all the causes and conditions which help to produce it are present.

Multiplication of effects, with the attendant production of differences, is the process by means of which the various forms of natural energy give rise to diversity of phenomena throughout the universe. It is attended by "differentiation" in all its forms, for instance, the unequal growth of crystals in different directions, the branching action of vegetables, and of animals, and thus to the developments of the almost infinitely varied shapes of minerals, vegetables, and animals. In accordance with the principle of differentiation, every solid body whether living or dead, grows to its own shape; thus a crystal of common salt formed in an aqueous solution, grows to the form of a cube; one of "blue vitriol" grows to an oblique prism; one of alum grows to an octohedron. Gold and diamonds form themselves into octohedra; and of all the thousands of other crystalline substances, each grows into its own particular form. The shape of each substance, living or dead, is modified by the influence of surrounding conditions; for instance, a crystal of common salt grown in urine forms itself into an octohedron; one of alum grown in an aqueous solution containing a little alcohol forms a cube; a plant grown in a poor soil is stunted; and the physical development of animals, including men, is well-known to be greatly affected by their surroundings during the period of growth. Similarly with the human mind; a man reared in a Christian country becomes more or less a Christian, whilst one reared in a Mahommedan land usually becomes a Mahommedan. The egg of a fowl whose food is deficient of lime has a shell which is thin and fragile, whilst that of a similar one whose food contains sufficient lime is thick and strong. "Development, no less than other vital phenomena, is a function of organisation" (Whitman). According to Von Baer's law, organisms become more special as they grow; we further know that in some cases mineral substances also differentiate as they increase, for instance, "metallic trees," formed by electro-deposition. Races of animals are kept separate by their instincts, *i.e.*, by the influence of different internal and external conditions acting upon them and stimulating them to keep apart, to differentiate; numerous tribes, communities, societies, classes, sects, and individuals, are kept asunder in this manner; just as if some occult influence, such as an "infinite mind" was governing them.

There are however limits to the phenomena of evolution and of growth. The fact that two distinct species of animals cannot be interbred ("The Unseen Universe," 1876, p. 170), is analogous to the truth that two inanimate substances belonging to two distinct systems of crystallisation cannot crystallise together to form a single homogeneous crystal; in each of these

cases the phenomena are incompatible, and illustrate the fundamental truth that contradictories cannot co-exist. Different animals, vegetables, and minerals, also grow to different magnitudes, doubtless in accordance with natural law; there are all grades of sizes of animals from that of microscopic insects to that of a whale; and similarly of vegetables and of crystals.

The principle of evolution is a great idea which has gradually been impressed upon the minds of men by scientific evidence, and it logically flows from those of causation, continuity of action, universality of motion, action and reaction, etc. According to these truths, out of nothing, nothing alone can come, we cannot create anything, not even an idea. All things are evolved; substances are evolved out of previous substances, actions are evolved out of previous ones, more complex forms of energy are evolved out of simpler forms, mental impressions and ideas are evolved out of antecedent ones, and out of feelings, desires, etc., by various processes. Mind is evolved out of life, and life is evolved out of inanimate matter. The present physical and mental state of a man has been evolved out of his immediately preceding states and environments; the child must precede the man; ignorance must precede intelligence, etc., and all in accordance with scientific laws. Each succeeding state of the universe has been evolved out of its preceding ones. As matter becomes more differentiated so its powers and capacities become more numerous and complex, but at the same time each original power becomes more limited; for instance, man has the greatest number and variety of powers of all animals, but the most limited degree of each of the primary ones; his intellect alone being greater. The scientific meaning of "creation of man" is not a forming of him out of nothing, nor out of a human rib, but a gradual evolution of him out of inanimate matter during a long period of time. Whilst causation is accompanied by obedience to law and maintenance of present state, differentiation is attended by advance and continual change. The law of evolution is the basis of self-improvement of individuals, and of progress of civilisation of nations; and men must be obedient to it by continually seeking the conditions of improving themselves. The worlds in space are supposed to have been evolved out of mist or gas gradually by condensation through immensely long periods of time. Evolution is not creation, but a change of state or condition, and is therefore consistent with eternal existence of matter and motion. According to N. Lockyer, the elementary substances are evolved out of each other by means of change of temperature, the simplest ones, *i.e.* those of the smallest atomic weight, such as hydrogen, alone existing at the very highest temperatures or in the hottest stars, those of the largest atomic weight such as gold, appearing only at lower temperatures (see *Nature*, June 1, 1899, p. 105).

As evolution applies to all animate as well as inanimate substances, and the existence of mind depends upon that of brain, it necessarily applies to the ideas as well as to the physical conduct of mankind. History tells us that various ideas which are promulgated now and supposed by many persons to be modern or new, are hundreds or even thousands of years

old; (that of evolution itself is quite 2500 years old); but of course they were then only guesses and hypotheses, and had but a mere fraction of the amount of evidence which we now possess to support them. For instance, Thales, about 600 years before Christ taught that "nothing comes out of nothing," and "passes away into nothing"; that everything changes, "all in motion like streams." Democritus 460, B.C., a pupil of Leucippus, and Leucippus before him, believed in the atomic constitution of the universe, that matter is indestructible, that plants came before animals, and the lower animals before man. Aristotle, a pupil of Plato, 384, B.C., perceived the great ideas of heredity and universal causation, that nothing comes by chance, and that "the formation of the world is the result of natural forces." Lucretius also, about 100 years B.C., said that the soul dies with the body and he had an incipient idea of "survival of the fittest," and that mankind had struggled upwards out of a state of savage barbarism. Not only scientific but also religious ideas have been similarly evolved, and some of the systems of theological ideas have subsequently decayed, and others are now decaying. It is evident that as science is a system of truth based upon proper and sufficient evidence, it is capable of evolving a purer morality and religion than the world has yet seen, and that it is much more likely than unprovable dogmas to evolve "a new heaven and a new earth" for the use of man:—

> "From seeming evil still educing good,
> And better thence again and better still
> In infinite progression."

The following is an illustration of evolution in social position. "The original ancestor was an illiterate agricultural labourer, muscular and physically strong; his son becomes an artisan and learns a manufacturing trade—he would be less muscular than his father; his son becomes a clerk, having learned to read and write, and he would probably be still less physically strong, but mentally stronger; his son, in turn, becomes a lawyer, and develops his intellect and reasoning powers, but not his body; his son becomes an eminent statesman, artist, or musician, and here the mind would be developed in one direction to a great state of perfection, but in others very little, and his body still less. The difference between the labourer and statesman is very great, but the transitional stages gradual, each generation developing those peculiarities most essential to success in that particular work he has chosen, and in that station in life in which he finds himself. But the statesman would still be a man, and the family likeness still there, although his muscles have degenerated and his brain developed" (M. Dorman, "From Matter to Mind" 1895, p. 55).

Each age and generation evolves its own kind of genius, dependent upon preceding ones. The intellect of Newton was largely a product of that of Copernicus, Kepler, Bouillaud, Borelli, and Hooke. Thus Bouillaud, in 1645 remarked, respecting the influence of gravity, that "if attraction

exist, it will decrease as the square of the distance." Borelli also, in 1666, maintained expressly that "the satellites of Jupiter and of Saturn move round their primary planets in the same manner as the moon does round the earth, and that they all revolve round the sun, which is the only source of any virtue, and that this virtue attaches them, and unites them so that they cannot recede from their centre of action." And Hooke, in 1674, said:—"I shall hereafter explain a system of the world differing in many particulars from any yet known, answering in all things to the common rules of mechanical motions. This depends upon three suppositions:—First, that all celestial bodies whatsoever have an attracting or gravitating power towards their own centres, whereby they attract not only their own parts, and keep them from flying from them, as we may observe the earth to do, but that they also do attract all the other celestial bodies that are within the sphere of their activity, and consequently that not only the sun and moon have an influence upon the body and motion of the earth, and the earth upon them, but that Mercury, Venus, Jupiter, and Saturn also, by their attractive powers, have a considerable influence upon its motion, as in the same manner the corresponding attractive power of the earth has a considerable influence upon every one of their motions also. The second supposition is this:—that all bodies whatsoever that are put into a direct and simple motion will so continue to move forward in a straight line till they are by some other effectual powers deflected and sent into a motion describing a circle, ellipsis, or some other compound curve line. The third supposition is:—that those attracting powers are so much the more powerful in operating, by how much nearer the body wrought upon is to their own centres. *Now what these several degrees are, I have not yet experimentally verified*, but it is a notion which, if fully prosecuted, as it ought to be, will mightily assist the astronomers to reduce all the celestial motions to a certain rule, which I doubt will never be done without it. He that understands the nature of the circular pendulum and circular motion will easily understand the whole of this principle, and will know where to find directions in Nature for the true stating thereof. This I only hint at present to such as have ability and opportunity of prosecuting this inquiry, and are not wanting of industry for observing and calculating, wishing heartily such may be found, having myself many other things in hand which I would first complete, and therefore cannot so well attend to it. But this I do promise the undertaker, that he will find all the great motions of the world to be influenced by this principle, and that the true understanding thereof will be the true perfection of astronomy" (Baden-Powell, "History of Natural Philosophy" p. 264).

It is evident from these quotations that the genius of Newton and his great discovery of universal gravitation were almost immediate products of, and evolved out of the ability and knowledge of the period; and that had he not made that discovery someone else would before long have done so. By the same mode of argument we may say that the great fire of London evolved the architectural ability of Sir Christopher Wren. An age of

superstition and of monkish "miraculous visions" excited the genius of Dante. A period of wealth gave rise to the ability of Adam Smith. An age of civil wars and controversies evolved the genius of scepticism in Montaigne, like one of political stratagem produced its Machiavelli, and the scandalous lives of the monks stimulated the ability of Boccaccio. And as all men are evolved by their immediately preceding causes, conditions, and environments, a very great number of similar instances must continually occur.

As it often requires a long period of time for a series of causes to produce a numerous succession of effects, so has it required an unknown amount of time to evolve our present state of knowledge and civilisation. "The present time is always full of the future" (I. Disraeli). The present state of the universe is a consequence of, and has been evolved out of its immediately preceding conditions, and so on backwards through all time; and the whole of its future states are implicitly contained in and will be evolved out of its present one in accordance with the great principles of science. The consequences of each man's actions whether good or bad continue onwards through all future time, and in this sense a man lives for ever. "You have to thank a past which begins with the first life of man on earth for most that you have and are, and in this sense the whole human race has lived in order that you might be able to live" (*The Open Court*, No. 45, p. 1085). We all owe much to those who have gone before us. With regard to the gradual evolution of man upon the surface of this globe, it is much less wonderful that a human being should be gradually evolved out of inanimate matter in the course of many millions of years, than that a child should be evolved in a comparatively few months out of the food partaken of by its mother.

> "Our feelings and our thoughts
> Tend ever on, and rest not in the present."
> —*Longfellow.*
>
> "New times demand new measures and new men;
> The world advances, and in time out-grows
> The laws that in our father's days were best."
> —*Lowell.*
>
> "New occasions teach new duties; Time makes ancient good uncouth;
> They must upward still and onward, who would keep abreast of Truth."
> —*Ibid.*

All mankind are, either consciously or unconsciously, pushing, struggling, towards the great hereafter in the incessant march of progress. Human evolution and progress is from the simple to the complex; from the monad to the oyster to man; from the savage in his cave to the emperor in his palace; from the packman with his stock-in-trade upon his back to the railway train with its great load of merchandise; from the canoe to the modern complex ocean-steamer and man-of-war; from the simple messenger of the olden time to the complicated postal system, the

telegraph and the telephone; from the use of a stylus to that of the typewriter and rapid newspaper printing press; from the simple mode of barter by the ancients to our present complex financial system of banking and credit; from the windmill and the watermill to the steam-engine and turbine; from the ancient distaff and handloom to the great cotton factories with their complicated machinery and tens of thousands of rapidly revolving spindles; from the hour-glass and clepsydra to the chronometer and watch; from the old-fashioned sickle to the reaping machine; from the antique flail to the threshing machine; from the simple and ancient oil-lamp to the present complex system of electric-lighting, etc., etc.

Mental actions are usually more complex than physical ones; mind is evolved out of body, not body out of mind; the common basis and stimulant to mental action is desire; and the ordinary cause and source of desire is the chemical and physical action and reaction upon each other of the different parts of the human body and its environments; and the dependence of each of these upon the ordinary properties of inanimate substances. Whilst in one class of actions, substances pass from a simple to a complex condition, in another they pass the reverse; in a process of chemical union the former occurs, and in that of decomposition the latter happens; during the growth of living things, and in that of civilisation, complexity increases, whilst during decline and decay it decreases; our living bodies return to inanimate substances. There are actions and conditions which determine growth, and others which cause decay. All bodies may be arranged in a series from the least to the most complex, from the simplest chemical elements to the more complex inorganic and organic compounds, onwards through the simplest vegetables up to animals and finally to men; and throughout this vast series the number and complexity of properties of each body increase with the degree of complexity of its composition and structure, the most complex structure being the human brain.

All growth and evolution in an animal is attended by a simultaneous process of degeneration and decay; evolution is attended by involution, a process of disappearing; accretion of protoplasm in the animal structure is accompanied by excretion; without continual wearing out and waste of the tissues the processes of life and evolution could not be maintained, and that whilst during the period of progress towards maturity the processes of accretion and evolution preponderate, during the decline of life those of decay are the most active.

An animal must continually decay in order to live. "All work implies waste of protoplasm." "Protoplasm cannot live unless it dies" (Huxley, "Lay Sermons," p. 132). The structure of a man is continually decaying into carbonic acid, phosphoric acid, water, urea, and ammonia. Growth is attended by an increase of energy, and decay by a decrease. Unlikeness is evolved out of likeness, and likeness is evolved out of unlikeness of all living things; thus all plants are evolved from sap, all animals from

blood, and all sap and blood from inanimate matter; and by a reverse process, all sap, blood, plants, and animals are changed into inanimate earth; and in these ways evolution and life are co-extensive with de-evolution and death, and the two are equally important in the economy of animate nature. Similarly, in inanimate nature, solid minerals are continually being evolved out of their solutions at one time, and dissolved by water into solution at another.

Disuse of living organs produces degeneration:—"In the stalactite caves of Carniola, the blind salamander, Proteus, is found in great numbers, also blind assels, blind cyclopida, blind insects and snails. In the mammoth cave of Kentucky, we find, in addition to other blind species, a blind craw-fish" (*The Open Court*, No. 105, p. 1803). "Any new set of conditions occurring to an animal which renders its food and safety very easily attained, seem to lead as a rule to degeneration; just as an active man sometimes degenerates when he suddenly becomes possessed of a fortune. Let the parasitic life once be secured, and away go legs, jaws, eyes, and ears; the active, highly-gifted crab, insect, or annelid, may become a mere sac, absorbing nourishment and laying eggs" (R. Lankester, "Degeneration," p. 33). Similarly, often with human beings, the more they are helped beyond a certain extent, the less they help themselves, they become ungrateful for that which they obtain too easily, they fail to develop their best qualities, become idle, vicious, parasitic, and then decay. The process of evolution in animals is not only accompanied by differentiation and the production of new organs and functions, but also by disuse and more or less disappearance of old ones rendered unnecessary by the change. Anatomists have discovered at least seventy vestigial structures in the human body alone (H. Drummond, "Ascent of Man," 1897, p. 123). Man's toes are disappearing; they have now usually only two joints, formerly they had three (M. Dorman, "From Matter to Mind," 1895, p. 106).

Whilst evolution promotes progress, de-evolution retards and regulates it, yet both are effects of natural energies acting in accordance with law; advance in civilisation is a result of preponderance of evolution over decay, and shows itself primarily in a gradual increase of intelligent population. All that we can reasonably expect, and that we usually find, with the evolution of any new improvement, is, not that it is in every way an apparent human benefit, but that after summing up all its pros and cons, it is, upon the whole, an advantage to mankind. We have in nearly all cases to submit to some drawback, to put up with some crime, ignorance, pain, suffering, or loss, in order to secure a small advance in civilisation, a balance of evolution over decay. From Nature comes the universal cry to all mankind—you either march or die. The entire universe orders us to "move on"; with one accord all Nature says—you must not march too slow, and with less stern command—you may not go too fast; a man must not overwork himself even in doing good to others. "In proportion as movement accelerates, societies consolidate—they pass through a pro-

found intellectual change" . . . "Nothing so portentous overhangs humanity as this mysterious and relentless acceleration of movement, which changes methods of competition and alters paths of trade; for by it millions of men and women are foredoomed to happiness or misery, as certainly as the beasts and trees, which have flourished in the wilderness, are destined to vanish when the soil is subdued by man" (Brooks Adams, "Law of Civilisation and Decay," 1898, pp. 297, 298).

The process of evolution and improvement of mankind is regulated by the great powers of Nature acting through men; and it is through ignorance of the great truths of science by the mass of mankind that the process of evolution is prevented from going on faster. Every human being is necessary to human progress, either to assist or retard it. The actions and ideas of the lowest grade of the human species are determined and limited by the properties, conditions, and environments of the bodily organism; then by means of conflict and difference this grade retards the progress of the next above it, that one ditto of the next, and so on up to the very highest. It is largely by the great deficiency of fundamental scientific knowledge in theologians and their followers that the progress of science and civilisation is retarded. Notwithstanding the great services which a knowledge of the principle of evolution has been to mankind by showing the systematic harmony of development of all living things, and the large indebtedness of mankind to Darwin and his predecessors for their great labours in this subject, the late Cardinal Manning is stated to have called Darwinism a "brutal philosophy" (E. Clodd, "Pioneers of Evolution," 1897, p. 147); notwithstanding also that the conditions of civilisation and advance are manifestly determined by natural energies in accordance with natural laws, another writer affirms that "there is no rational sanction for the conditions of progress" (B. Kidd, "Social Evolution," 1895, p. 64). "Regard it how we may, the conclusion appears inevitable, that, to the great masses of the people, the so-called lower classes, in the advanced civilisations of to-day, the conditions under which they live and work are still without any rational sanction" (*ibid.*, p. 73). "In the midst of the highest civilisations of the present day, reason has been, and continues to be, unable to offer any sanction for the prevailing conditions of life" (*ibid.*, p. 81). With regard to these statements, I beg leave to remark that the conditions of human life and progress are as much determined and sanctioned by the influences of natural energy and law as any other phenomena; they are not supernatural nor "ultra-rational," and the very fact that they are natural phenomena brings them within the category of reasonable existences; and if they appear to be "without any rational sanction," it is not because they are really and essentially so, but because unscientific persons cannot perceive the fundamental causes which determine them; it is well-known also that the average conditions of life of the great masses of the people in "the highest civilisations of the present day," are more favourable than ever they were (consult Mulhall, "Progress of the World," 1880, pp. 6,

102, 119, 135, 141). And with regard to the italicised statement, that "*the interests of the social organism and those of the individuals comprising it at any particular time are actually antagonistic; they can never be reconciled; they are inherently and essentially irreconcilable*" (Kidd, *ibid.*, p. 85); and the further statement:—"As the interests of the social organism and of the individual are, and must remain, antagonistic, and as the former must always be predominant, there can never be found any sanction in individual reason for conduct in societies where the conditions of progress prevail" (*ibid.*, pp. 86, 87), I may remark, that as the whole system of Nature, including man and the conditions of his existence, when comprehensively examined is manifestly an essentially consistent one, the view that one part is "actually antagonistic, inherently and essentially irreconcilable" with another, is a superficial conclusion; and to say that "they can never be reconciled," is assuming a great power of prediction, without adducing proper and sufficient evidence to prove it. We may reasonably conclude that universal, omnipotent, and omnipresent energy acting according to immutable law, is sufficient "rational sanction" for all "the prevailing conditions of life" whether painful or not. Conflict is not essentially antagonism; the struggle for life is not a real "evil," but a necessary condition of improvement and progress. The interests of a man and those of his fellowmen are not really antagonistic, although when viewed in a very narrow aspect they appear to be so. In the government of this world the energies and laws of Nature are much too important to be suspended merely to prevent the conflict of individual men with society. Evidence of the existence of "rational sanction in individual reason" for the phenomena of human society may be found in various parts of this book.

14. "Chronological Order of the Sciences." Order of Universal Dependence.

Closely connected with the subject of evolution is what has been termed "the chronological order of the sciences," or that order in time in which the sciences have been evolved. This order is from the simple to the complex, and the same as that of their chief dependence upon each other, each succeeding one being dependent upon the prior development to a certain extent of the simpler ones, somewhat in the following order—viz., logic, mathematics, mechanics, physics (including heat, light, electricity, magnetism), chemistry, physiology, psychology, sociology, etc. Whilst all these branches of knowledge advance side by side together, the more complex ones cannot progress beyond a certain stage until the simpler ones are sufficiently advanced; in this way psychology, sociology, and religion have to wait for all the others. Included in this idea is another—viz., that "man is a microcosm," an epitome of all the forces of Nature, and of all the sciences—the most complex, the last evolved, and most variously

endowed of all living things. The simple sciences *explain* the complex ones, and the complex sciences *illustrate* the simpler ones; and the simpler the science the greater is its fundamental importance.

The "chronological order of the sciences" is a necessary consequence of the operation of universal energy upon mankind. The human faculties being exceedingly limited in relation to the immensity and complexity of Nature, man usually discovers the easiest things first—the laws of mechanics and astronomy before those of chemistry, physiology, etc., and in this way the laws of mental action, which are the most complex, are the least advanced, and amongst the last to be discovered. By gradual refinement of means—*i.e.*, of mental processes and material inventions and methods—we have been able to detect feebler and feebler phenomena, and more and still more important influences, and, last of all, universal molecular motion, radiation, the universal ether, the electro-magnetic character of light, etc. By a similar process of advancing from the superficial to the profound, it is not improbable that the directions of motion of the molecules of bodies, and the modes of transformation of different forms of molecular energy into each other, such as chemical energy into heat, heat into electric current, chemical oxidation of cerebral into mental energy, nervous energy into muscular motion, etc., etc., may be found, and a mathematical and geometrical basis of thermal, electric, chemical, vital, and mental action will be discovered.

The whole of animate and inanimate things and actions may be represented as a series of hierarchies. In addition to the idea of a chronological order of evolution of the more complex and concrete sciences out of the simpler and less concrete ones, there is that of an order of dependence of all ideas upon each other from that of simple existence and of continuity and time up to that of man and mind; thus the intellect of man is dependent upon, and is by a process of differentiation evolved out of his animal powers, his animal powers are based upon and are a differentiated product of his vegetative functions, his vegetative functions are dependent upon and evolved out of the molecular motions of his material substance, and his material substance can only exist in space and in time. We cannot form a complete essential idea of a man without that of his existence in time and space, of his movements, his material structure, his form and size, his vegetative functions, his animal powers, his senses, and his intellect. According to this scheme, the existence of intellect or mind depends upon a larger number of essential conditions than any other thing, whilst that of time is, so far as we know, entirely unconditional, and has been termed "the continuous independent variable." Further, this scheme includes the idea that in the process of evolution as ordinarily understood, *i.e.*, from the simple to the complex, anything which is evolved depends essentially for its existence upon that out of which it is evolved, but not the converse; and that whilst an effect is essentially dependent upon its cause, a cause is not essentially dependent upon its effect. An action which follows another in point of time is essentially dependent upon that

which precedes it, but not upon that which follows it, and there necessarily exists an order of such dependence of phenomena upon each other in point of time. The present state of the Earth is based upon and is a product of all the states of the Earth which have preceded it, but not of any states of it which have to come. Motion depends upon substance because it cannot exist without it, but substance does not depend upon motion, unless we adopt the hypothesis that "matter is motion"; similarly, brain can exist without mind, as during the condition of sleep, but not mind without brain. The essentials of mathematics are also essentials of all the more complex sciences, and all the phenomena of the latter are essentially related to number and magnitude.

In man and other intelligent animals the intellect depends upon the perceptions, the perceptions upon the senses, the senses upon the animal functions, the animal functions upon the organic ones, the organic ones upon the bodily structure, and the latter upon the physical and chemical properties of the inanimate substances of which it is composed. Like every part of a man's body is dependent upon every other part for its health and enjoyment, so every man is dependent upon every other man, and every nation upon every other nation for its well-being, and every globe in the universe is dependent upon every other globe for its position and direction of motion in space. This general principle of mutual and universal dependence is the basis of altruism, of the social existence of men in families, nations, etc., and of many other human phenomena.

It must not, however, be forgotten that the foregoing is only one-half or a one-sided view of living nature, the building up or synthetic aspect, and that there is the reverse, viz., the disintegrative or analytical view, in which de-evolution process the more complex things are resolved into less complex ones, and the most complicated structure, man, with his most complex organ, the brain, is resolved into inanimate dust and gases, and his vital and mental energies are retransformed into simpler forms of energy and of molecular motion. It is certain that unless the living plant or animal disintegrated sufficiently fast as it was built up, and that the exhausted material was removed as fast as it was formed, life and evolution could not continue.

A very strong proof of the dependence of all things upon energy and its modes of action, termed "laws," is the fact that they all have to wait their time for the necessary conditions of increase and decrease, development and decay; thus vegetables have to wait the advent of spring, of solar heat and of rain, etc., for their growth, and of autumn and winter for decay; boys have to wait for bodily growth and development of mind to become men, and men have to wait for death to relieve them from labour and care. The leading idea of astrology that the fates of men are, in a certain limited sense and degree, dependent upon the heavenly bodies is another example; thus it is certain that without the heat and light of the sun all life on this globe would cease, and that the stability of the earth in its orbit, and consequently the safety of all living creatures upon it, is dependent

upon the gravitative "attraction" of the sun. Multitudes of instances might be adduced of the mutual dependence of all things upon all things throughout the known universe.

15. The Universal Ether.

An extremely attenuated, incompressible, and undulating medium, which pervades all bodies and all space, has a calculated density of about one 936,000 million million millionth part of that of water, or equal to that of the atmosphere at a height of about 210 miles from the earth, but vastly greater than that of the atmosphere of distant interstellar space. A single cubic mile of it at the surface of the earth would have a minimum weight of about a 1,000 millionth of a pound. The universal ether is calculated to exert "at each point in space an elastic force of 1,148,000 million times that of the air at the earth's surface, and a pressure upon the square inch of 17 million million pounds" (Herschel, "Familiar Lectures," etc., p. 282; F. D. Wrede, *Phil. Mag.*, 4th series, vol. xliv, p. 82). As it occupies all space, the most perfect vacuum attainable would still be filled by it. Its presence in space has been supposed to retard the motion of comets. It can, by means of its transverse vibrations, convey various kinds of molecular energy from one substance to another at a very great velocity, equal to about 186,400 miles per second, *i.e.*, the speed of transmission of light. Gravitating matter is supposed to modify the density and mechanical properties of the ether in some unknown way.

As it is the medium through which we receive all our light, heat, and magnetic influence from the sun, our very existence, and that of all animals and vegetables, depends upon it. Without it we could not receive any radiant heat or light from a lamp or fire, a magnet could not attract iron, a mariner's compass would not point to the north, and could not be used to guide ships, nor a dynamo-electric machine to produce an electric current. We could not see the sun, the stars, or any other heavenly body, we would be entirely destitute of all knowledge of astronomy, of the existence of infinite space, and largely ignorant of the sciences of heat, light, electricity, and magnetism. Photography would be impossible, lighthouses would be useless. The eye, without the universal ether, could not convey to us any information to guide our actions, and would degenerate and decay. As the absence of the ether would so greatly diminish our knowledge, it would as largely decrease our ability of acting correctly and cause us to commit a great many errors, even our moral and social actions therefore depend upon it. This world, and all that is upon it, including ourselves, are practically connected with all the worlds in the universe, and are affected by them through the medium of the universal ether and the influence of gravitation. The universe is made up of atoms and ether (W. K. Clifford). The normal vibrations of the ether, corresponding in direction to those of sound waves, "must be propagated incomparably more swiftly than the transversal

vibrations which constitute light; with a velocity, accordingly, which, if finite at all, must at least be incomparably greater than one of 186,400 miles per second. These normal vibrations, if they exist, may conceivably afford a means of communication to enormous distances at a rate which may be deemed instantaneous," "with a velocity so great that we are unable to assign any limit to it, while the means of communication are such as to involve only disturbances of inconceivable minuteness in an existing medium" (Sir G. G. Stokes, "Natural Theology Gifford Lectures," pp. 32, 33). If this suggestion should prove correct, the velocity of transmission of the normal vibrations of the ether would be similar to that of transmission of gravity, and might be regarded as an ever-existing condition like time, space, and substance. This is, however, only an hypothesis. The universal ether is a medium which is capable by its vibrations of exciting a great variety and vast number of actions, and of producing an immense number of effects, viz., all that radiant energy can produce. "Déscartes was the first philosopher who maintained the existence of an ether occupying the pores of glass and all transparent bodies" (D. Nasmith, "Makers of Modern Thought," 1892, vol. ii. p. 263).

16. Universal Radiation.

The subject of universal radiation is practically unlimited in extent. The entire universe is filled with rays, and the whole of the substances in it, together with the all-pervading ether, are full of different kinds of waves and vibrations. This immense variety of radiations has been grouped into different classes, each class consisting of an immense number of rays of different wave-lengths, for instance, visible rays, invisible rays, rays of heat, light, magnetism, ultra-red rays, ultra-violet rays, anode rays, cathode rays, Lenard rays, Röntgen rays, high temperature rays, low temperature rays, possible rays of gravity, etc., etc.; the total number of rays of different wave-length may therefore be regarded as infinite. There are rays which are deflected by a magnet, and others which are not; some which will pass through certain metals, and some which will not. Every atom and molecule of matter, as well as every mass of substance, and every world in space emits and imparts to the universal ether a different set of invisible radiations and excites in the ether a different collection of waves; and all the phenomena of bodies are being increasingly explained by the gradual extension of a mechanical theory of vibrations. According to Professor Langley's experimental researches, even cold bodies emit a variety of heat rays, and each cold substance has its own thermal spectrum. The spectrum of invisible solar rays is ten or twelve times longer than that of the visible spectrum. An immense number of dark worlds in space emit invisible rays, which have been discovered by means of photography.

"Material substance acts in a sphere" (J. Bayma, "Molecular Mechanics," 1866, p. 33), by means of radiation. Every substance,

whether solid, liquid, or gaseous, and whether hot or cold, is incessantly emitting, absorbing, transmitting, and reflecting radiations; and every different one emits, absorbs, transmits, and reflects a selection of rays different from those emitted, absorbed, transmitted, and reflected by every other substance; even the different groups of rays are therefore practically infinite in number. Every different substance also emits, absorbs, transmits, and reflects a more or less different group of rays at every different temperature and pressure. The particular rays, whether visible or invisible, which any individual substance emits are precisely the same as those which it absorbs at another temperature and pressure, and as every different substance has its own select group of rays, that special group is characteristic and representative of that particular substance and that one only; thus sodium is known from all other substances by its emission and absorption of the double yellow line D, by means of which it has been detected in the atmosphere of the sun and in other heavenly bodies. In consequence of every different substance having the power of absorbing different rays and classes of rays, the rays emitted by any particular substance are more or less "sifted" in their passage through other substances, the sifting or absorption varying with the nature of the emitting and the absorbing substances, their thickness, temperature, and pressure; a substance which is opaque to one ray or one collection of rays may thus be transparent to another; for instance, a strong solution of iodine is opaque to rays of light but transparent to those of heat; a plate of quartz is much more transparent than one of glass to the invisible ultra-violet rays of light; some kinds of glass are more transparent than others to Röntgen rays, and aluminium is much more transparent to them than the heavier metals. Some kinds of rays are transmitted by a greater number of substances than others, thus while comparatively few substances freely transmit light, nearly all except iron, nickel, and cobalt, transmit rays of magnetism, even a thick stone wall is highly transparent to them. Heavy substances are generally more opaque to nearly all rays than lighter ones. In some cases the rays which are reflected back by a substance are themselves thereby altered or transmitted, as in the phenomena of fluorescence, in which rays of white light are changed into and reflected back as coloured ones. As invisible ultra-violet rays can be transmuted into visible ones by fluorescent substances, such as platino-cyanide of barium, or an alcoholic solution of chorophyll or of horse-chestnut bark, and as there are rays of some kind or other always radiating from and passing through, by night as well as by day, every known substance; when we obtain sufficient knowledge of how to transmute the different classes of invisible rays into visible ones, all things which are now opaque to our vision will become virtually transparent; if, for instance, we could transmute the invisible rays of magnetism into visible ones we could see a magnet through a stone wall; we are now practically doing this by telegraphing with Hertzian vibrations. One of the numerous effects of the extension of our knowledge of the practically infinite subject of universal

radiation will be a great extension of our power of detecting crime, and consequently of increasing morality; men must become more moral when all their actions are rendered visible.

The extremely important truth is far from being adequately realised that the molecular motions of all bodies are continually transmitted in the form of ray-vibrations and waves of the universal ether, in all directions at a great velocity, equal to about 186,400 miles per second, through all surrounding space and substances, some of those vibrations being intercepted and absorbed by those substances and altering their properties. For instance, the luminous radiations of the sun, burning gas, oil, candles, paraffin, fires, electric lamps, etc., are always passing through transparent bodies more or less perfectly, but are intercepted by all opaque ones, alter their properties, and in many cases chemically decompose them, alter their colour, "bleach" them, etc.; thus sunlight is well-known to destroy the colour, especially pink or light red, of carpets and tapestry, bleach linen, produce photographs, etc., etc. Similarly, the molecular motion and property of magnetism is constantly radiating in the form of vibrations from a magnet, and passing with the velocity of light, through all substances around, except iron, steel, cobalt, and nickel, which intercept some of them, and are thereby altered in property and become themselves magnets. The rays of heat also, proceeding from the sun and from all burning and heated bodies, either pass through other substances with that great velocity, or are intercepted by them and alter their properties, set them on fire, or in the case of magnets affect their magnetism, etc. Some of the rays excited in an electric discharge vacuum tube, according to Professor Röntgen and others, similarly pass almost instantaneously through aluminium, diamonds, glass, wood, flesh, etc., but are intercepted by some heavy metals, by bone, by imitation diamonds, and by an ordinary photographic surface. Rays from an electric arc ripen fruit; Röntgen rays "sunburn" the hand; and those from an electric furnace inflame the skin of the face. Moser observed that solid objects laid in actual contact upon one another mutually depict their images upon each other, probably by the influence of the rays produced by their molecular movements. Pellatt further discovered that metals placed almost in contact with each other slightly altered their electric states, but concluded that it was due to their vapours. And I have found that a number of different substances of very diverse properties emit radiations at ordinary temperature, some of which, even at a distance of two or three inches, alter the strength of current of a voltaic cell (*Philosophical Magazine*, 1897). Every dead and living thing is immersed in an infinite ocean of ethereal vibrations, and the vibrations affect every animate and inanimate substance.

Each of these classes of ethereal vibrations consists of an immense number of rays of different degrees of refrangibility and consequently of different property; and the whole of this great number of rays admit of an incalculable variety of combinations and an infinite number of permuta-

tions, so that if each combination and permutation of rays could be used to represent an idea or message from one person to another, there would be a vastly greater number than could be used by all mankind. We know that if any one of these combinations or permutations is disturbed at any one point in space the disturbance is transmitted in every direction with an immense velocity, and that luminous disturbances are constantly being detected by self-registering photographic apparatus; that disturbances of the sun's magnetic influence and of terrestrial magnetism are similarly being detected and registered by suitable magnetic receiving arrangements at meteorological observatories; and that distant changes of heat rays from the sun, etc., can be detected by means of a bolometer or a radio-micrometer. In this manner it is evident, that if by means of a proper exciter, any sufficiently large disturbance of any of the above-mentioned vast number of combinations or permutations of rays, of any one of those forms of energy, is produced at a distance, it may possibly be employed as a message from one place to another, by the aid of suitable means for directing and concentrating the rays, and of a sufficiently sensitive and suitably attuned receiving apparatus or arrangement, without requiring the assistance or directive influence of a wire. This has already been done for one class of rays by means of Marconi's apparatus.

Not very many years ago, on the same day (September 1, 1859), "It was observed by Mr. Carrington, and by Mr. Hodgson, both astronomers, at different places simultaneously, that a very bright spot suddenly appeared upon a particular part of the sun's surface, moved through a space of about 35,000 miles, and lasted about five minutes; other persons remarked that the self-recording magnetic needles at Kew Observatory were strongly affected at precisely the same period; and it was further observed that strong electric currents were produced at the same time in the telegraph wires nearly all over the earth—all these circumstances indicating a terrestrial magnetic storm here coincident with the solar outbursts, although the distance between the sun and the earth is about 92 millions of miles." The foregoing facts and many others illustrate the general truth that causation is omnipresent, and that no action of any magnitude can happen in any part of the universe, without its being telegraphed throughout the realms of space by means of radiation through the universal ether. The transmission of sound by the air will assist the ordinary reader in imagining the mode of action in the ether, but the direction of vibration differs in the two media.

By a vast majority of "practical" men who are largely unacquainted with the altruism and beauties of science, who cannot see any practical good in anything which does not yield them some personal advantage in the form of large and quick pecuniary returns for investments, such great and abstruse truths as these are ignorantly called "scientific hobbies," "amusements," and "unpractical," and laborious researches to discover them are termed—only playing with things. But science has already, by investigating the rays of energy which traverse all bodies and all space, given, not

simply to one single millionaire, but to all mankind, rich and poor alike, the great practical advantages of photography, the electric-dynamo, electric light, the electric furnace, etc., and is just now giving us the ability of photographing and of virtually seeing the interior of the human body; and we may reasonably expect that in due course we shall be able to take photographs and perceive things through stone walls, and telegraph to great distances without the aid of wires. The "hobby" of Galvani's experiments has grown to the electric telegraph, and will become much greater yet. As the universal ether is filled throughout with all the infinite variety of vibrations due to and representing the molecular properties of all the bodies, solid, liquid, gaseous, animate and inanimate, in the universe, it must potentially represent the properties of all those bodies, and each substance will be identified by its special collection of radiations and absorptions; another effect will be that a mechanical theory of molecular motion, and of the origin of the properties of inanimate substances, and even of animate bodies, will gradually be developed, and we shall be able to directly convert each single form of energy into others without the great losses which attend such conversions at present, and thus to more directly utilise the solar rays, the energy of terrestrial rotation, etc., in place of the combustion of coal. As incompatible molecular movements cannot co-exist in the same substance, they annul each other and are often converted into heat; we know that repeated approach and recession of magnets warms them.

Whenever any two different substances, animate or inanimate, approach or recede from each other, the number of ethereal radiations from each which fall upon each increases or decreases, and the properties and behaviour of each body slightly change, probably in consequence of alterations produced in their internal molecular movements, but in many cases the changes are so small that we have been unable to detect them, and this is not surprising when we consider that it requires the entire mass of the earth, equalling about 6,000 million, million, millions of tons, to attract an ounce with the force of an ounce. The above statement is also true with regard to all magnetic bodies, electrified substances, heated or illuminated bodies, photographic substances, etc., and the amount of such change of property in each substance varies in every different case, and is usually greater the more opposite the characters of their molecular movements. By mere proximity, the particular kind of property and molecular motion of one substance, tends to excite through the medium of the ether, the same property in others.

The most universal of all forms of radiation is that of gravity, which, like that of light and radiant heat, varies in strength inversely as the square of the distance. It is hypothetically considered that the velocity of transmission of gravity is immensely greater than that of light, and that all substances whatever are perfectly transparent to its rays, and nothing can intercept them or suspend their action; and we know that all rays except those of gravity can be intercepted by means of screens. All energy is motion, and

that of gravity probably arises from a particular kind of atomic motion which is of the same character in all bodies, and this is probably the reason why all substances are transparent to it. As all substances are transparent to the rays caused by their own particular movements (otherwise they could not emit radiations from their internal parts), if the kind of motion which we call gravity is the same in all bodies, it necessarily follows that all bodies are transparent to its rays. It is probable that the great difficulty of ascertaining its velocity arises from the facts:—(1) that it is an extremely feeble form of energy; (2) its action cannot be suspended even for one moment; and (3) because it cannot be intercepted; if these difficulties could be overcome its velocity would probably be found to be the same as that of light. As motion is the only known cause of motion, and all known forms of energy are modes of motion, gravity is probably the original source of all the less simple forms of energy, being differentiated and rendered more complex by various conditions; thus we know that the gravitative attraction and consequent great pressure and friction in deep mines sets fire to coal; that the gravitation of water drives turbines and water-wheels; that the friction of tides produces heat; that a pound weight falling through about 772 feet evolves sufficient heat to raise the temperature of one pound of water one Fahrenheit degree; and many other examples.

17. Universality of Energy and Motion.

"By ceaseless motion all that is subsists."
—*Cowper.*

"See, this air, this ocean, and this earth,
All matter quick, and bursting into birth."
—*Pope.*

Energy is the "soul" of Nature.

The whole of nature is like a mighty river in a state of incessant flow and internal movement, ever moving as a mass and in its inmost molecules, each kind of molecular and of mass movement having freedom within certain limits. Similarly, the whole of the phenomena of animate and inanimate bodies are flowing onwards in a state of incessant change, with freedom of variation between the two opposites of evolution and degeneration, aggregation, and disintegration. Each individual, each community, sect, and nation, is always in more or less danger of a social Scylla and Charybdis by defect or excess of activity, the two extremes of decay and of revolutionary action. If the retarding section of mankind has all its own way, mankind relapses into idleness and ignorance, and if the advancing one governs all human action, the incessant change is more than ordinary persons can bear.

Universally, motion alone causes motion; if you only wave your hat, away runs the cat. The universe is filled with matter and motion. There exists no known instance of matter without motion, substance without energy, nor intelligence without nerve substance and nerve change. The mere evaporation spontaneously of water, a lump of ice or of camphor, without the application of heat, shows that they are each in a state of molecular motion; Becquerel's uranium rays, ditto. There is no known case of perfect molecular rest of any substance; it is by means of molecular action that we (and all things) exist, and move, and have our being. Motion is continuous and indestructible, and universal energy is omnipotent and omnipresent. All movement requires time, there is no instantaneous movement. The cause of all motion is pre-existing motion; we know nothing at present of the final origin of motion. We know that the particles of all bodies are in an incessant state of invisible motion, and that this often gives rise, either gradually or suddenly, by acts of transformation, to visible motion and to the various well-known modes of energy. Democritus, 460 years before Christ, maintained the view of incessant molecular motion in bodies. As the molecular motion of unchangeable substances, such as platinum, gold, diamonds, etc., does not perceptibly diminish by lapse of time, we conclude that the molecules of substances generally are frictionless bodies moving in a frictionless medium, the universal ether; and as change of property is attended by either loss or gain of molecular movement, we infer that the properties of substances are consequences of their molecular motion. A substance cannot move itself, but can only receive motion from another moving body; similarly a man is continually influenced by his internal and external conditions, and an act of will is not one of creation of energy.

Motion without matter appears to be inconceivable, but we have a near approach to it in the vibrations of the universal ether; and that which has been inconceivable in one age, such as the idea of living beings at the antipodes, has in various cases become conceivable in a later period. "Matter is that which possesses inertia, *i.e.*, resists change of motion, state, or property. Matter is whatever can occupy space" (P. G. Tait). "The discovery of the ultimate nature of matter is probably beyond the range of human intelligence" (*ibid*). We do, however, know some recondite truths about it, viz., that its particles are in an incessant state of motion; that in various cases, one solid substance can pass through another like water through a sponge, for instance carbon through iron, and gold through lead; and further, that various forms of radiant energy can pass through opaque bodies like light does through glass; and our knowledge of such recondite truths about it is continually increasing; indeed, it has been said that "matter is motion" (see "The Doctrine of Energy," by B. L. L. Kegan Paul & Co., London, 1898). Matter has been called "frozen force," and it may be truly viewed as "potential energy," because when a substance comes into the presence of other substances under suitable conditions the energy of each acts and reacts upon each other. The fact that gravity acts

equally on equal masses of all kinds of substances, indicates the existence of an essential unity of motion and of matter. Matter has been ignorantly termed base, brutish, dead, earthy, etc., as if it was completely inert, but this is a great misconception; matter of every kind, solid, liquid, or gaseous, is full of motion, not merely molar motion, or that of the mass which all men can see, but also molecular motion, or that which is invisible even with the help of the most powerful microscope; and the terms, matter, motion, and action, may be regarded as largely synonymous. The whole of the universe, including mankind, is in a state of movement. The whole of the laws of molar and molecular motion which apply to inanimate substances necessarily apply to animated bodies, and apparently also to all the phenomena of the human brain and mental action, for the more completely the subject is investigated the more consistent with all known truths does this conclusion appear; inanimate substances implicitly and potentially contain the energy which in organised structures appears in the form of life and mind. As universal molecular motion is the source of all physical, chemical, vital, and cerebral energy, sufficient understanding of it will yield us fundamental explanations of all known phenomena.

Guthrie, Bjerkness, Dvoräk, Stroh, and others, have produced by means of mechanical movements of liquids and gases, similar attractions and repulsions to those produced by electrically charged bodies, electric currents, and magnets; and as the laws which represent the visible motions of masses similarly represent the invisible motions of molecules, we infer the causes of many of the visible actions of bodies to be due to molecular or atomic motions. Every substance, whether living or dead, solid, liquid, or gaseous, may be considered to be a collection of molecular motions, each different one having a different set of movements, and consequently a different set of properties which distinguishes it from every other substance; and the collection of such movements, even in the smallest particle of a simple elementary substance, is considered to be much more complicated than the molar movements of the entire solar system. "There can be no doubt that the ultimate particles of a crystal are really in motion" (H. A. Miers, "Individuality in the Mineral Kingdom," 1896, p. 20). "Symmetry is to crystals what health is to animals" (*ibid.*, p. 23), *i.e.*, a consistent system of motion. "A lump of sugar is an universe of moving worlds" (J. P. Cooke, "Scientific Culture," 1882, p. 94). Déscartes stated: "The philosophers even seem universally to have observed this, that all the variety of matter, the diversity of its forms, depends on motion; for they said that Nature was the principle of motion and rest, and by Nature they understood that by which all corporeal things became such as they are found in experience" (C. L. Morgan, "Springs of Conduct," 1885, p. 89). Matter never rests, it and motion are coextensive and as far as we know coeval; both dead and living substances are alike in this respect. Eternal motion is, in a figurative sense, eternal life.

Similar to a magnet at a fixed distance from a piece of iron, suffers no

loss or gain of magnetic energy, so the molecular motions of all substances remain unchanged in kind and amount as long as the substances and their environments continue unaltered and the action and reaction between them are equal and balanced. A molecule cannot move itself nor move in opposite or different directions or with different velocities at the same time. Whilst some movements are compatible and harmonise with each other, others (for instance, opposite ones) are incompatible and cannot coexist in the same substance; and between these extremes there are others which are more or less compatible and give rise to compound movements; similarly with the properties of bodies, some are incompatible with each other, whilst others are mutually compatible; mixed properties are therefore equivalent to mixed molecular movements. In accordance with the definition of matter, as that which resists motion or change of motion, all substances, which are in a state of molar rest or motion tend to remain so, and all those which are molecularly stable tend to remain stable, but only under unchanged conditions. Stability, however, is a matter of degree, thus gold and platinum are extremely fixed, whilst iodide of nitrogen explodes even if gently touched by a feather, and nearly all animal and vegetable substances gradually decompose. Violent phenomena, whether mechanical or social, are usually due to sudden liberations of energy; and that which we term "rest" is a state of balanced motion.

As even the densest substances contract in volume by loss of heat and by powerful compression, their molecules are not in actual contact with each other; and as the molecules could not separately vibrate if they were in mutual contact, it necessarily follows that they affect each other not by contact, but through the universal ether which pervades all bodies and all space.

As the molecular motions of all bodies are affected by temperature and pressure, so each different substance becomes more or less a different one and has more or less different properties at every different temperature and pressure, for instance, iron becomes nearly non-magnetic at a red heat; a pink solution of chloride of cobalt becomes opaque indigo blue at 100° c.; solids melt, and liquids vaporise by rise of temperature; gases become liquids and solids by cold and pressure. It is in consequence of differences of molecular motion that different substances act physically and chemically upon each other; for instance, a magnet attracts a piece of cold iron; a piece of phosphorus inflames by contact with oxygen at 15° but not at 200° c. All actions and changes, even those of consciousness and mind may be considered to arise from some previous changes or differences of motion, either molecular or molar, of the cerebral or nerve substances in which they occur; it is only when the brain becomes sufficiently active that consciousness occurs. Not only molecular motion, but even motion of the mass is able to confer new properties or substances, thus a flexible chain when moving very rapidly in the direction of its length, becomes rigid, and does not bend when struck; a top and

a gyroscope is stiff during its rotation and cannot be easily deflected. The laws of motion appear to be applicable to all the phenomena in the universe; and one of the chief objects of science, though a very remote one, is to resolve all phenomena into ideal motions; and we at present view the different kinds of energy, heat, light, magnetism, etc., as different varieties of molecular or atomic motion.

By means of molecular motion, more finely constituted substances pass through coarser ones; thus liquids soak through solids, gases diffuse through liquids and solids, and the vibrations of the universal ether pass instantly through solids, liquids, and gases. Solid gold perceptibly diffuses through three inches of solid lead in three days (Roberts-Austen, *Nature*, December 3, 1896, p. 114). Like finer solids gradually penetrate between coarser ones or a small dog can find his way through a dense crowd of men, so smaller vibrations pass through collections of greater ones; those of heat pass through diathermanous bodies; of light through transparent ones; of ultra-violet rays through another class of substances; of magnetism through diamagnetics, boards, brick walls, and stones; Röntgen rays through light metals, wood, flesh, etc., and those of gravity through all bodies and screens of every kind. Why do we term heat, light, electricity, magnetism, life, mind, etc., mysterious powers? it is simply because we do not yet know the particular kind of molecular or atomic motion of which each of them consists; as fast as we learn more of them we wish to know still more, and until we have discovered all possible knowledge respecting them we shall continue to call the remainder mysterious, and some of the unscientific part of the community will continue to call them "supernatural."

All substances are also in a state of molar motion, *i.e.*, motion of the mass, and are, in nearly all cases, continually altering their distances from each other, for instance, each member of the solar system travels in an approximately elliptical orbit, and is constantly varying its distance from the sun, as well as from all the myriads of bodies in space. The fixed stars, or sidereal suns, also, which appear not to move in position with regard to each other, are continually moving with great velocities in different directions; some of them also are continually varying in brightness and colour, and therefore in molecular movement. "Amid stellar space stars or suns are rushing hither and thither with motions varying according to the attractions at work in various parts of each star's course. We see that in vaporous matter, or widely-distributed cosmical dust, similar motions are continually taking place. The expansive tendencies of gaseous matter are found to be due to the rush of minute molecules in all directions. So that, in the universe of matter as revealed to the astronomer, the same general laws affect the suns which people space, the largest discrete masses we know of, and the molecules which form the intimate substance of gaseous matter, bodies so minute as to lie hopelessly beyond the range of any conceivable increase of microscopic power. In organic matter the same law holds. All the physical processes which

are most obvious and familiar, all those which form the subject of the most recondite scientific research, are in reality illustrations of the constant redistribution of matter and motion" (R. A. Proctor, "Mysteries of Time and Space," 1892, p. 363). The whole sidereal system of heavenly bodies is alive with movements (R. A. Proctor). The earth's motion is equal to 100,000 feet a second (Stewart and Tait, "The Unseen Universe," 1876, p. 148). All parts of the air, the sea, and the land are constantly moving; "Scandinavia is rising in the north and sinking in the east; South America is rising in the west and sinking in the east" (Lubbock, "Beauties of Nature," 1897, p. 225).

According to Darwin and others, plants are always in motion; they move by the influence of heat, light, chemical action, moisture, etc, the spores of seaweeds and many microscopic plants swim. Astronomers state that the moon has more than sixty different molar movements, produced by the influence of other heavenly bodies upon her. The great drama of universal motion and of life on this globe is incessantly evolving and moving onwards like a vast panorama before our eyes, and apparently without pause or variation of average molar velocity.

The entire surface of the earth and of the bottom of the sea is also in continual movement, and producing the well-known bendings and contortions of rocks and their strata. "Near Quito the trembling of the earth is almost incessant" (Boussingault). According to geologists, the surface of the earth "is always creeping."

"Continents are being slowly depressed or upheaved, mountain ranges are being raised to a new level, table-lands are in process of formation, and great valleys are being gradually scooped out"—"old shore lines shift their place, old soundings vary; the sea advances in one place and retires in another"—lands are rising, and sea-bottoms are sinking. New islands appear, and others disappear. Sweden, Nova Scotia, and the shores of Hudson's Bay are "gradually uprising, Greenland slowly sinking" (R. A. Proctor, "Light Science for Leisure Hours," 1871, pp. 213, 225). The atmosphere and mass of the sun, and of all the other heavenly bodies, are in incessant movement.

When substances vary their mutual distances, or come into contact with each other, a transfer or a change of motion occurs, thus the approach of our earth to the sun deflects its direction of motion. The impact of two oppositely moving bodies produces heat, and sometimes light; lead bullets fired at an iron target are sometimes melted by the concussion; the mere contact of phosphorus and oxygen is attended by a loss of molecular motion of each substance, and a conversion of that motion into light and heat which radiate away into space, and are absorbed by other bodies. The molecular energy which escapes from a substance during its act of chemical union with another may be thus dissipated away into space in definite fractions at a time, until the originally energetic bodies become a comparatively inert mass, for instance:—(1) if metallic sodium be exposed to dry air it oxidizes by uniting chemically with the oxygen to form oxide

of sodium, and evolves a large amount of heat; (2) if the oxide of sodium thus produced be exposed to aqueous vapour, it unites with water to form hydrate of sodium, and loses a second large quantity of heat; (3) if the hydrate of sodium be brought into contact with damp carbonic acid, it unites with it to form carbonate of sodium, and again loses heat; (4) if the carbonate of sodium thus formed be immersed in hydrochloric acid, it is decomposed, and forms chloride of sodium, and a fourth fraction of heat is set free; and (5) if the resulting sodium chloride is added to sulphuric acid, it is turned into sulphate of sodium, a perfectly neutral salt, and a comparatively inert substance, and parts with a minute residue of heat.

In consequence, on the one hand, of the influence of universal motion compelling men to be active, and, on the other, of the influence of time being required for every change to occur, even the progress of civilisation is affected and is rendered gradual; and, whilst the influence of internal motion stimulates men to be active and improve, that of inertia is sufficiently strong to allow them time in which to do so. As an illustration of this, it took many years for the system of lighting by gas to surmount all obstruction and become general, and electric lighting is now similarly requiring a number of years to overcome the hindrances to its adoption. Two centuries were required for tea and coffee to become national drinks (Dr. Wynter, "Curiosities of Civilisation," p. 11).

The principle of incessant motion and conflict is seen in the never-ceasing mechanical and chemical actions of bodies and substances upon each other, the never-ending conflicts between nations, sects, and individuals, between science and ignorance, between the poor and the rich, the weak and the strong, employers and employed, between opposite political parties, between competitors in trade, in manufactures, and in commerce, between rival railway, shipping, and carrying companies, between commercial nations, and in a multitude of other ways. As all contradictory motions and ideas necessarily neutralise or destroy each other, the remaining ones must be harmonious, and, as all movements are in accordance with law, there is a scientific basis for expecting greater general harmony in the future. Conflict and opposing movements are necessary for the health and progress of mankind.

Universal energy governs everything; all human existence and progress depend upon compulsory movement; men are compelled to be active by internal and external circumstances: they could not move unless the blood circulated in their bodies, nor think unless it produced molecular chemical action in their brains; they are compelled to act by two classes of influences, viz., by their animal feelings and by ideas; the former conduce more to bodily existence, and the latter more to intellectual maintenance and progress. The animal desires stimulate men to obtain food, clothing, a habitation, and to continue the species; and the intellect stimulates them to govern their actions.

"By restless undulation; even the oak
Thrives by the rude concussion of the storm."
—*Cowper.*

"All things that are
Made for general uses are at war—
Even we among ourselves."
—*J. Fletcher.*

18. Variety, and Unity in Diversity.

In addition to universal motion throughout Nature there are the great features of unity and variety. Every particular and special case is an instance of diversity, and is included in a unity or general truth. It has been estimated by a most competent authority that the number of different kinds of living creatures upon this globe is about three hundred and sixty thousand; even the different varieties of snow crystals is said to be "no less than one thousand," and the number of inanimate things in general is so enormously great that it is not even approximately known. In whatever direction we look, or in whatever manner we observe or examine, there is dissimilarity; and this extends not only to things of sense, but to some of those existences which we can neither see, hear, smell, taste, or touch; for instance, the invisible molecular motions of substances, the rays of light,[1] the rays of different refrangibility of which are vast in number, the ultra-violet rays, and the rays of heat, ditto; and the infinite variety of vibrations of the universal ether which pervades all bodies and all space. But as far as we know, both time and space appear to be perfectly unvariable.

The fundamental causes of variety are the ceaseless molecular motions of substances, and the relations of those motions to those of their environments. It appears to be in consequence of the small innate differences of molecular movement of the different elementary substances that each of them, and of their compounds, minerals, salts, etc., grows to its own particular shape and texture. As far as we know at present, the elementary substances do not merge into each other by insensible degrees or gradations of atomic weight, specific gravity, or other property, but in a more or less sudden and conspicuous manner, by a kind of jump, or a *per saltum* difference between the members, even of the nearest allied ones, for instance, chlorine and bromine, bromine and iodine, oxygen and sulphur, potassium and sodium, etc. A similar difference, by sudden leap without gradation, occurs in the molecular weights of their compounds, a conspicuous example of which is the series of oxides of nitrogen; and these differences are accompanied by sudden dissimilarities of less fundamental property, of form, colour, specific gravity, etc., between every pair of nearest allied compounds, for instance, the sub-oxide of copper is red

[1] Rays of light are themselves invisible; they only render material substances visible.

whilst the protoxide is black, the bromide of mercury is white whilst the iodide is scarlet, etc. There are "periodic series" and "chemical families" of the elementary substances, and a very large number of families of their compounds, each family being distinctly different in secondary properties from all others, and thus arises a great variety of series of inanimate substances. Families of crystals are distinct from each other, and have great differences in their forms and other properties like those of plants and animals; and the "missing links," or more correctly—differences, are as conspicuous as those between man and monkey. The underlying minute differences of molecular motion, magnified by the influence of time, space, and environment, being a fundamental attribute of all material bodies, determine their secondary properties, and give rise to the endless variety of inanimate substances, and indirectly to an immense variety of forms and modifications of types of forms in plants and animals. There is usually more visible change of energy in living things than in dead ones:

> The groups of differences, not one but two,
> Make the unlikeness of I and you.

Like produces like in inanimate as well as in animated bodies; in crystals as well as in vegetables and animals; we cannot change sulphur into silver nor grow grapes on thistles; the product of man is man, not monkey. Crystalline cubes of common salt, dissolved in water and recrystallised, produce cubes; doubly oblique crystals of sulphate of copper similarly treated, produce doubly oblique ones, etc. But like also produces unlike under different circumstances; as we see the rectilinear motion of a piston-rod produce circular motion of a wheel, so do two portions of the same salt sometimes produce two different forms of crystals under different conditions. Death produces life, and life produces death, in all living structures; inanimate materials produce living structures in plants, and life in plants and animals gradually produce earthy matter by decay and death. Except in fundamental property, such as mass or weight, like substances and bodies produce, under unlike conditions, a great variety of unlike ones; thus liquid water produces solid ice or snow when chilled, or invisible vaporous steam when heated. Abnormal varieties of form and property both of inanimate and of animated things are produced by abnormal conditions or environments; thus unusually shaped crystals of various substances are formed at high temperatures or from highly acid solutions; hybrid vegetable productions are common, monstrosities of chickens are formed from eggs, the shells of which have been varnished on one side; abnormal human beings have been the offspring of abnormally-shaped parents; children with six fingers have been born of parents having that deformity. That the same substances and species are capable of considerable variations without destroying their fundamental properties or identity is shown in minerals, vegetables, and

animals; for instance, in diamond and charcoal, "in the poppy, in the Ancon or otter-sheep," etc. (J. J. Murphy, "Habit and Intelligence," 1869, vol. i, pp. 197-243). "All living beings have a capacity for variation," and all mineral and inanimate substances have also that power in a less degree; we know, for example, that oxygen may exist either in its ordinary state or as ozone; phosphorus as red and as white; selenium and carbon, similarly.

Variety is everywhere present; there are no two stars exactly alike. The variety of properties of bodies is practically infinite, and as the properties are representatives of the atomic, molecular, and molar motions of bodies, the variety of these motions is also practically endless. As the differences in refrangibility of the various radiations of heat, light, magnetism, and all the other kinds of rays which are incessantly emanating from all substances are virtually infinite in number, so also must be the dissimilarities of the vibrations of the universal ether which transmits them. And when we add to these ideas the additional one, that all substances are in a state of change or flux in time and space, varying from instant to instant, and at no two periods exactly alike, throughout all time, the degree of variety is immeasurably increased, and is still farther extended beyond all human comprehension and calculation. But although man possesses no power of fully comprehending, or adequately appreciating, the practically boundless extent of variety in Nature, he is nevertheless competent to show by his power of inference that it is immeasurably vast, and to adduce reasonable evidence for its being so.

This great general truth, of endless variety in Nature, is accompanied by another equally extensive, viz., that of "unity in diversity," uniformity of principle amidst diversity of detail. Omnipresent unity in diversity is a great characteristic of Nature, of science, and of universal truth; and the great uniformities of science, in the form of species of energy, of laws, principles, and general truths, constitute a great united system, which ramifies through all the diversities and details of knowledge, and binds them together in one harmonious whole by the bond of continuity, like the trunk, branches, and twigs of a tree unite all the foliage harmoniously together to form a systematic combination of strength and beauty. Whilst also the bodies and minds of all the twelve hundred millions of human beings on this globe are essentially similar and illustrate unity, no two are exactly alike in detail, nor is the same individual exactly alike at any two consecutive periods of time. All inanimate substances, all plants, all animals, are alike in essentials, but different in minor points, all exist in time, occupy space, are connected together by the bond of continuity of cause and effect, are in a state of incessant molecular motion, are continually moving through space, possess weight, are affected by each other through the universal ether, and by the forms of energy termed heat, light, electricity, and magnetism, but differ in the minor points of form and structure.

"The modes of animal life are almost infinitely diversified; some live on lands, some on water; of those which are aquatic some dwell in rivers,

some in lakes or pools, some on the sea-shore, others in the depths of the ocean. Some burrow in the ground, some find their home in the air. Some live in the arctic regions, some in the burning deserts; one little beetle (Hydrobius) in the thermal waters of Hammam-Meskoutin, at a temperature of 130°. As to food, some are carnivorous and wage open war; some, more insidious, attack their victims from within; others feed on vegetable food, on leaves or wood, on seeds or fruits; in fact, there is scarcely an animal or vegetable substance which is not the special and favourite food of one or more species. Hence to adapt them to their various requirements we find the utmost differences of form and size and structure. Even the same individual often goes through great changes" (Lubbock); this is beautifully and wonderfully illustrated by the life-history of butterflies. According to the same author, "the total number of species" of animals "may probably be safely estimated as exceeding 2,000,000"; and "of extinct species the number was, doubtless, as great" ("The Beauties of Nature," 1897, p. 96). "There are at least 2,000 species of ants, no two of which have the same habits" (*ibid.*, p. 58); and "about 500,000 living species of plants" (*ibid.*, p. 163).

Wherever we look, or whenever we by any means observe the universe around us, with an intelligent mind, we perceive variety in constitution, magnitude, distance, position, form, colour, and movement, in all things, great and small, with unity of laws in accordance with the whole. Variety in all things, whether animate or inanimate, is largely a consequence of the processes of evolution and differentiation (see section 13). We know by universal experience that no two substances are exactly alike, that in consequence of this they each affect a third one differently, and therefore have each a different effect upon the same human being, and owing to differences in us, each person receives a somewhat different impression from the same object, as well as a different sensation from every different thing we see or in other ways observe, and a further difference when we view it in a different aspect. We know also that with no variety or no change, there is no excitement, no consciousness, no feeling; that motion, activity, or change is life, and that perfect monotony or rest, without variety, is sleep or death. A condition or state of perfect rest, of molar stillness, if only for a moment, is a state of perfect balance of the internal energies of a body and the external ones acting upon it. Variety and change, as well as unity in diversity, are necessary conditions of life and health in all living things; "beware of fixed habits." "Variety is charming," largely because it produces a healthful change of sensation; and nearly all the enjoyments of life are pervaded by it; the variety, however, must be of a proper kind; and unity in diversity gives safety and stability to all our enjoyments, because the unity is in harmony with universal energy, law, and order. Variety is a source of human health and pleasure in a multitude of ways, in foods, flavours, occupations, reading, conversation, the drama, painting, melody, etc. Everyone seeks variety by visiting theatres, amusements, exhibitions, churches, chapels, foreign

countries, etc. Even a flat country appears beautiful to those who live amongst mountains. "Man cannot live on bread alone"; nearly every article of food, however good, if taken continuously for too long a period, disagrees with health :

> "A little nonsense now and then
> Is relished by the wisest men."

Nearly every person is familiar with the pleasant and healthful sensations produced by viewing an extensive and varied landscape; the near and distant objects, the hills and dales, land and water, the massive cliffs and rocks, the brightness of the sun and its reflections from ponds and streams, the varied tints of colour from the different fields, houses, rocks, and rivers, the far-off town, the hamlets, solitary houses, and church spires dotted o'er the scene, the ruined castle on the cliff, the sheep and cattle in the fields, the white line of steam of the distant train, the freshness of the pure air and the genial warmth of the sun, the white fleecy clouds floating across the sky, the ships at anchor in the bay, the boats in full sail, the distant ocean-liner with its long trail of smoke on the horizon, the fishermen on the beach, the moving objects on the roads, the merry groups of children at play, the ringing chimes, the music of the village band, the odour of the new-mown hay; these and many more, each and all giving us a different and enjoyable impression, and illustrating the great truth of universal variety. The foregoing facts illustrate not only the idea of variety, but the fact that every different body has a different set of properties, that each is affected by every other one in a different manner, and that man is differently affected by each and all, at a distance and through the medium of the universal ether which transmits the vibrations due to each and all of them; and that without the ether and its capacity of transmitting vibrations we would lose nearly all our enjoyments.

The universe and human life constitute not only an infinitely complex panorama of moving objects, but an incessantly changing one—a stream of progress, and not only incessantly changing and progressing, but subject to continual variation of speed, a continually recurring ebb and flow; and it is this complex combination of conditions which, whilst it charms and excites us by its variety, confuses and puzzles unscientific minds.

Notwithstanding that diversity is being continually evolved out of unity in all directions, and that every discovery of a new scientific law or comprehensive truth, and of every new fact, extends our knowledge of unity in diversity, it has been said that it is, and will be, "demonstrably impossible that any merely physical science should ever penetrate to the unity which is behind diversity; for out of a merely physical unity diversity could never evolve itself" (J. J. Murphy, "Scientific Bases of Faith," 1873, p. 196). But the fact remains that it does so evolve itself, and that all the discoveries in science help men to gradually acquire some knowledge of the unity in diversity, and to explain the unknown by the known, the

simplest existences by things which are simpler still. According to some scientific writers, the whole of the visible universe was evolved out of the universal ether (Stewart and Tait, "The Unseen Universe," 1876, pp. 158, 199, 239). Newton penetrated to a great unity behind diversity when he discovered the great principle of gravitation; Oersted similarly when he found electro-magnetism; and Faraday when he discovered magneto-electricity.

There are agreements of difference as well as of likeness which make variety charming; things are not necessarily contradictory, incompatible, or even inharmonious, because they are unlike. This is abundantly proved in music by the perfect harmony of certain sounds; and when scientific men have had the time and the means, they will doubtless be able to trace the whole of the harmonies and discords of Nature, including those of sociology, morals, mind, emotion, sensation, and animal state, gradually down to the movements of molecules and atoms of living and non-living substances, and to vibrations of the universal ether in which they are immersed. Agreement of difference is a large bond of union in all societies, between the sexes, and in all individuals living together. Agreement of likeness is also a bond of union; thus the lamb cannot mate with the lion, nor the dove with the eagle, but lions can mate with lions, and sheep with sheep.

Throughout Nature there is an attraction of likeness and an attraction of unlikeness, also a repulsion of likeness and of unlikeness. All the globes in the universe, and the masses and molecules which compose them, "attract" each other by the power of gravitation. Plants of the same species are determined to the same localities, and therefore towards each other, by likeness of properties and of the molecular movements which cause them. Animals of the same kind are "attracted" towards each other by harmonious likeness, and the sexes towards each other by harmonious unlikeness, and are "repelled" from each other by discordant unlikeness; thus lions are attracted towards each other by harmonious likeness and unlikeness, and repel all other animals by discordant unlikeness. The "attraction" of harmonious unlikeness, and the "repulsion" of discordant likeness, is clearly shown by the behaviour of magnets, of electrically-charged bodies, and of electric currents. The "attraction" of harmonious unlikeness is often much greater than that of likeness; thus the "attraction" of strong chemical union of dissimilar bodies is millions of times stronger than that of gravitation of similar or dissimilar ones. All these harmonies and discords may be scientifically viewed as inseparable concomitants of harmonies and discords of molecular motion:

> "Though he and I were one in kind,
> Yet he was rich where I was poor;
> And he supplied my wants the more
> As his unlikeness fitted mine."
>
> —*Tennyson.*

19. Universal Change and Decay.

The universe, each of its separate parts, solid, liquid, or gaseous, and its living vegetables and animals, however minute, exhibits not only an extremely complex structure and scene, but an ever-changing one, no two views of it or of any one of its separate parts at consecutive periods of time, however short, being exactly alike. All bodies and forms of energy are changing or transmuting, but none are destroyed. "Nature, which governs the whole, will soon change all things which thou seest, and out of their substance will make other things, and again other things from the substance of them, in order that the world may be ever new" (Marcus Aurelius). Even nations and languages become corrupt and decay, and many have quite disappeared. Whilst all things are becoming old, all are becoming new.

In consequence of continual changes of distance between masses, and of frequent and in some cases constant influences acting between them, everything in the universe is incessantly altering. Thus the varying distance and position of the sun with regard to the earth produces the seasons, that of the moon in relation to the earth produces the tides; the constant contact of the air causes organic substances to decay, and that of water washes away earth, and dissolves away stones, etc. In consequence also of varying molecular and molar motion the individuality of form, condition, and appearance of everything, great or small, living or dead, is incessantly changing, some rapidly, and some with extreme slowness; thus a man varies in condition from minute to minute, and he is not exactly the same man to-day as he was yesterday. In many cases of contact attended by chemical union, the individuality, appearance, and properties of substances, suddenly and greatly change. For instance, no one would recognise in common salt the yellow and poisonous gas chlorine, nor the brilliant white metal sodium, from which it was formed; some of their secondary properties have largely disappeared. The sudden explosion of gunpowder converts a black solid substance into a mixture of colourless gases. The contact of colourless solutions of iodide of potassium and chloride of mercury instantly produces solid red iodide of mercury. Thousands of other instances might be adduced.

Every material substance is continually changing in temperature; that of the surface of the sun with the occasional outbursts of heat; that of every portion of surface of the earth, during summer and winter, day and night, from hour to hour, and minute to minute. The temperature of the air and of every animal and vegetable, and every stick and stone is always changing, and to maintain a perfectly uniform temperature of anything is practically impossible. The pressure of the air is also continually altering. Changes occurring in our bodies and brains cause ideas, thought and imagination by day and dreams by night. The mental actions of man and other animals are always changing. Alterations occurring in our bodies

and brains are attended by changes in our physical, mental, and moral conduct; thus uric acid in the blood produces gout and makes men peevish and irritable. The composition of the brains of animals changes with age; the blood vessels of the brain in some old men are quite brittle, and the bones of aged persons are easily broken. The chemical composition of every animal and vegetable is constantly altering; the human body, and probably that of every other animal contains more earthy matter when old than when young; thus we are gradually returning to an earthy and inanimate state long before we die. Personal improvement by lapse of time largely absolves a man from punishment, because he is an altered man. Disuse of our powers produces degeneration and decay; we must either keep moving or die; we cannot remain in an unchanged state; we must either advance or retreat. Even the great pyramids of Egypt, "more than forty in number," are gradually crumbling to dust, and the large number of deserted, ruined, and buried obelisks, temples, and cities, in the East, in Central America, Italy, and other parts of the world, all testify to the universality of change and decay; truth, time, and space are alone immutable.

"Turn, turn, my wheel! All things must change
To something new, to something strange;
Nothing that is can pause or stay:
The moon will wax, the moon will wane,
The mist and cloud will turn to rain,
The rain to mist and cloud again,
To-morrow be to-day."

—*Longfellow.*

All the great globes in space are slowly changing; the earth we inhabit is gradually diminishing its speed of rotation (Geikie, "Text-book of Geology," 1893, p. 15), its orbit is becoming more circular, and its day gradually longer, in consequence of tidal friction and the consequent dissipation of its energy of motion in the form of heat. "The stars are not unchangeable. Our own sun is undergoing continual change, and probably will die out, and, as a sun, cease to exist, before many millions of years have passed, perhaps before many thousands have passed. It is also believed by astronomers that not many millions of years ago our sun was in a condition quite unlike that in which he at present exists" (R. A. Proctor, "The Expanse of Heaven," 1874, p. 149). Each member of our solar system was probably once a mass of vapour; and nearly all luminous celestial bodies are considered to be increasing in weight by the incessant attraction of meteorites into themselves.

The stars, some of them slowly and others very quickly, are well-known to wax and wane; for instance: "In the year 1572 a new star suddenly appeared in Cassiopeia, and increased in brilliancy until it surpassed all the other stars; on a sudden, November 11th, it was as bright as Venus at her brightest. In the following March it was of the first magnitude.

It exhibited various hues of colour in a few months, and disappeared in March, 1574." "A star suddenly appeared in Serpentaria in the year 1604, and was at first brighter than Venus. It lasted more than a year, and passing through various tints of purple, yellow, and red, became extinguished." "If there be a multiplicity of worlds in infinite space, there is also a succession of worlds in infinite time" (Draper, "Conflict of Religion and Science," 21st edition, pp. 177, 178, 243). A new star "appeared in Corona Borealis in 1866, one in Cygnus in 1876, and one in Andromeda in 1885; then came the one in Auriga in 1892, and last of all was one in the southern hemisphere, discovered in 1893" (N. Lockyer, *Nature* July 11, 1895, p. 254; *ibid.*, January 16, 1896, p. 256). Even worlds get old, and become cold, the hottest are in their prime; "the moon is absolutely arid-dry, desolate, and dead" (Proctor, "Mysteries of Time and Space," 1892, p. 78).

It is well-known to astonomers that there is a star in the constellation Argo, which in the year 1843 was nearly equal in brightness to Sirius, that its light then diminished rapidly until in 1863, when it could only just be seen on the darkest and clearest night, and that this star or sun now gives out less than one hundredth of the light and heat which it gave out daily at the former period (*ibid.* "The Expanse of Heaven," pp. 197, 198). And that another, of about the tenth magnitude, known as the Blaze Star, in the constellation of the Northern Crown, suddenly, about the year 1867, acquired fully one hundredfold the brightness of that of one of the second magnitude, doubtless by a tremendous conflagration in it (*ibid.* p. 199). For aught we know, if there are human beings upon planets revolving round suns which have suddenly increased in brightness and temperature, they would all be burned alive by the conflagration. If, like these stars, our sun was either to greatly lose heat, or more likely, to greatly increase its temperature, all life on this globe would cease:

> "And, like the baseless fabric of this vision,
> The cloud-capp'd towers, the gorgeous palaces,
> The solemn temples, the great globe itself,
> Yea, all which it inherit shall dissolve,
> And, like this insubstantial pageant faded,
> Leave not a rack behind."
>
> —*Shakespeare.*

Destruction and decay are universal; the very rocks are continually being cracked by earthquakes and by never-ceasing pressure; they disintegrate by frost and by oxidation and solution, they fall as avalanches, they are melted in volcanoes, they are washed away by the sea, they are honeycombed with great caverns by the solvent power of the carbonic acid in rainwater, especially those formed of limestone. The mammoth cave of Kentucky is said to contain 226 avenues, 57 domes, 11 lakes, 7 rivers, 8 cataracts, and 32 abysses, some of them being very deep (F. Pouchet, M.D., "The Universe," 13th edition, p. 488); its waterworn passages are

calculated to be several hundred miles in length. The amount of rain which usually falls upon one square mile of chalk in one year has been calculated to carry away 140 tons weight of that substance; but the quantity depends largely upon the presence of decaying vegetable matter which supplies carbonic acid. The loss of altitude of the great limestone range of the south of Ireland was computed by the late B. Jukes to amount to as much as from 300 to 400 feet. Millions upon millions of tons of stone are continually being carried out to sea in the form of mud by the rivers. The river Thames carries down about 550,000 tons, and the Ganges about 1,022 million tons of mud, to the sea every year (St. George Mivart, "On Truth," 1889, p. 307).

From various causes, physical, commercial, social, and moral, numerous cities have either decayed, been destroyed, or have disappeared, for example, Thebes, Babylon, Baalbec, Nineveh, Palmyra, Carthage, Ephesus, Pompeii, Herculaneum, the buried cities of Central America, Palenque, Copan, and many others. "Even cities have their graves" (Longfellow). "Where are those 4,000 cities of Egypt?" (R. Burton, "Anatomy of Melancholy," 1845). In various cases, cities have been built upon the ruins of previous ones over and over again, for instance, Schliemann found at Hissarlik (called Troy), "below this, the remains of no less than six successive prehistoric settlements" (Max Müller, "Natural Religion," 1892, p. 202). The vegetable world also suffers destruction by whirlwinds, storms, prairie fires; by the stronger plants overpowering the weaker, by excess of moisture, by drought, etc. Vast numbers of young plants are killed by frost. Cattle destroy young birch trees. Myriads of human beings have been destroyed by famine, marsh-disease, jungle-fever, black death, cholera, small-pox, gluttony, and drunkenness, wars, religious and racial hatred, the inroads of stronger races, and most of all by ignorance of the means of preserving life. Whole races of animals and vegetables have decayed, and their antediluvial remains are now found in the crust of the earth; many great masses of rocks are composed of the remains of dead animals and vegetables, for instance, coal, chalk, coral reefs, oolite limestone, etc. The Sphynx and the Egyptian Pyramids are formed of limestone masses of shells, Paris is built of such limestone, and Berlin is built upon a bed of animalcules (Pouchet, "The Universe," 13th edition, pp. 15-24); ancient Germany rests upon vast beds of coral and madrepores (*ibid.*, p. 51). Nearly all animals and vegetables kill each other; the weaker are killed by the stronger; men kill nearly every living thing, whether vegetable or animal, fish, flesh, or fowl; sportsmen and vermin destroy game; wild beasts, serpents, alligators, and sharks, kill men; multitudes of seals are destroyed by men; insects by birds; rats by dogs; mice by cats; a single frost kills countless millions of insects; and to sum it up, the entire ocean and the crust of the earth is a vast charnel-house of the remains of things which were once alive. "The Romans burned the books of the Jews, of the Christians, and of the philosophers; the Jews burned the books of the Christians and of the Pagans; and the Christians burned the books of the

Pagans and the Jews" (I. Disraeli); the Christians pillaged and destroyed the great library of Alexandria. The whole of mankind have in all ages been largely occupied in killing each other. But what is destruction? it is change of form; matter is not really destroyed, neither is energy, both are only transformed; the structural shape and condition alone disappear; we usually call it destruction when the change is rapid or violent, and decay when it is quiet and slow. We often call change an "evil" when it is not really so; life depends upon destruction and decay; without the destruction of animals or vegetables we would be starved; without the continual decay of our tissues and the removal of the waste we would quickly die; without the death of one generation of men the next would have less room to live; death and decay, therefore, are in more senses than one, the feeders of life. The great beauty of vegetation depends upon a supply of dead and decayed matter upon which plants exist; the most luscious fruits are formed out of manure.

The phenomena of "waste" are closely allied to those of destruction and decay; the apparent waste of substance, energy, and of animal and vegetable life throughout Nature is enormous, and would require a lengthy treatise for its description; the waste caused by man is also extremely great. Countless myriads of seeds of plants are carried away by the wind, are washed away by the rain, are dried up by the sun, and are allowed to rot; how few acorns become oaks: similarly with the ova of fishes, less than one per cent. become fish, and largely similar with all other animals. Untrained man wastes nearly everything with which he has to do, and especially that which is plentiful or cheap—such as water, coal, and food; he wastes his time, life, health, and opportunities; he wastes his life largely in idleness or excess of amusement; his health in selfish excesses; his opportunities through want of decision and promptitude, and by mistaken conduct; his mental health by neglecting to acquire wisdom, by filling his mind with trifles, by dwelling upon grievances, or upon irrational "pious" desires. He wastes his physical health and food by eating and drinking to excess; and he wastes time in unnecessary exercise in order to counteract the evil effects of these. We all live to waste and die, and very few men can look back upon a life free from waste; how little we have to show for all our expenditure of thought, time, money, and energy, especially in matters of research and experiment; how much ineffectual thought; how many erroneous ideas, and how few correct ones; how many negative, unsuccessful, and imperfect trials even in ordinary life. Even in the simple composition and writing of an essay, how many transcribings, recastings of paragraphs and sentences, corrections, and substitutions of words. The best books are largely written in vain, and are but little read; the wisest opinions are the least heeded, largely because the mass of mankind are not sufficiently trained to appreciate them. How much fuel is wasted in ordinary fires, and under steam boilers; the very best steam-engine "wastes" 87 per cent. of the energy in the coals, and in the electric lamp less than 1 per cent. of the energy of coal which is

used to drive the steam-engine and dynamo is utilised as light; but notwithstanding these great losses, enormous use is made of those machines. What is waste? We may call it usually a purposeless or useless expenditure of matter or energy; it is not real destruction of either, but transformation in accordance with molecular movements and the laws which relate to them; it is a diversion of substance or energy to produce other effects than those we desire; but our wishes and desires are often very ignorant and selfish ones; where all is change and progress, what we term destruction, waste, and decay are very secondary matters. Waste serves great purposes which are often difficult to comprehend, and accords with the universal powers and laws which regulate the speed of evolution and the progress of mankind; nevertheless the maxim, "Waste not, want not," is a very practical and useful one. What is luxury? often it is possessions not employed to do the greatest good.

In the modernised words of Chaucer:—"The oak which grows so slowly, and has so long a life, at last wastes away and dies. Even the hard rock in time wasteth away; broad rivers run dry; great cities decay and disappear, and all things have an end. So also of the human race. All die; some in youth, others in old age; kings as well as commoners; some in their beds, some in the deep sea, some in battle-fields." "To-day we visit the tombs of our friends; to-morrow, other friends visit ours."

"We receive such repeated intimations of decay in the world through which we are passing; decline and change and loss follow decline and change and loss in such rapid succession that we can almost catch the sound of universal wasting, and hear the work of desolation going on busily around us. 'The mountain falling cometh to nought, and the rock is removed out of its place. The waters wear the stones, the things which grow out of the dust of the earth are washed away, and the hope of man is destroyed.' Conscious of our own instability, we look about for something to rest on; but we look in vain. The heavens and the earth had a beginning, and they will have an end. The face of the world is changing daily and hourly. All animated things grow old and die. The rocks crumble, the trees fall, the leaves fade, and the grass withers. The clouds are flying and the waters are flowing from us."

"The firmest works of man, too, are gradually giving way; the ivy clings to the mouldering tower, the briar hangs out from the shattered window, and the wall-flower springs from the disjointed stones. The founders of these perishable works have shared the same fate long ago. If we look back to the days of our ancestors, to the men as well as to the dwellings of former times, they become immediately associated in our imaginations, and only make the feeling of instability stronger and deeper than before. In the spacious domes which once held our fathers, the serpent hisses and the wild bird screams. The halls which were once crowded with all that taste and science and labour could procure, which resounded with melody, and were lighted up by beauty, are buried by

their own ruins, mocked by their own desolation. The voice of merriment and of wailing, the steps of the busy and the idle have ceased in the deserted courts, and the weeds choke the entrances, and the long grass waves upon the hearthstone. The works of art, the forming hand, the tombs, the very ashes they contained, are all gone."

"Whilst we thus walk among the ruins of the past, a sad feeling of insecurity comes over us ; and that feeling is by no means diminished when we arrive at home. If we return to our friends, we can hardly speak to them before they bid us farewell. We see them for a few moments, and in a few moments more their countenances are changed, and they are sent away. It matters not how near and dear they are. The ties which bind us together are never too close to be parted, or too strong to be broken. Tears were never known to move the king of terrors ; neither is it enough that we are compelled to surrender one, or two, or many of those we love ; for though the price is so great, we buy no favour with it, and our hold on those who remain is as slight as ever. The shadows all elude our grasp, and follow one another down the valley ; we gain no confidence, then, no feeling of security, by turning to our contemporaries and kindred. We know that the forms which are breathing around us are as short-lived and fleeting as those were which have been dust for centuries. The sensation of vanity, uncertainty, and ruin is equally strong, whether we muse on what has been long prostrate or gaze upon what is falling now or will fall so soon."

"If everything which comes under our notice has endured for so short a time, and in so short a time will be no more, we cannot say that we receive the least assurance by thinking on ourselves. When a few more friends have left, a few more hopes deceived, and a few more changes mocked us, 'we shall be brought to the grave, and shall remain in the tomb, the clods of the valley shall be sweet unto us, and every man shall follow us, as there are innumerable before us.' All power will have forsaken the strongest, and the loftiest will be laid low, and every eye will be closed, and every voice hushed, and every heart will have ceased its beating. And when we have gone ourselves, even our memories will not stay behind us long. A few of the near and dear will bear our likeness in their bosoms till they, too, have arrived at the end of their journey and entered the dark dwelling of unconsciousness. In the thoughts of others we shall live only till the last sound of the bell, which informs them of our departure, has ceased to vibrate in their ears. A stone, perhaps, may tell some wanderer where we lie, when we came here, and when we went away ; but even that will soon refuse to bear us record ; 'time's effacing fingers' will be busy on its surface, and at length will wear it smooth, and then the stone itself will sink or crumble, and the wanderer of another age will pass, without a single call upon his sympathy, over our unheeded graves" (Greenwood).

Many of the doctrines and opinions of men are as fluctuating as their bodies ; sects and religions innumerable have passed away, and the vain unprovable dogmas of Christian and other religious sects are following them,

being carried away by the omnipotent stream of natural energy acting in accordance with the great principles of causation and evolution. No human power can prevent the doctrines of an infinite personal Deity, the immortality of human minds, the redemption and salvation of souls, miracles, transubstantiation, Papal infallibility, and a number of others built upon these, from gradually decaying and disappearing into the darkness of the infinite past. But "sufficient unto the day is the evil thereof"—"it is useless to kick against the pricks"; the only proper course for mankind is to submit like rational beings to omnipotent powers, accustom their minds to holier and truer beliefs, and patiently wait for untruths to perish.

20. Importance of Small Influences.

The popular mind and the untrained one is nearly always most impressed by sudden and violent phenomena, those which most affect the senses, and considers them to be the most important; but the scientific one attaches greater value in many cases to those minute ones which are constant and general, because the smallest influence acting throughout infinite time produces an infinite amount of effect, and the smallest difference increasing at a minute rate, either during infinite time or throughout infinite space, becomes infinitely large; an extremely feeble force also such as that of gravity, multiplied by an infinite mass, becomes infinitely great. Infinite time permits infinite change, and infinite space permits infinite difference of motion, distance, and position. Gradual increase of wealth, followed by diminished industry, increase of amusement and of general laxity of conduct, is more certainly ruinous to a nation than a single violent war.

Small signs often indicate important phenomena; thus, when Faraday first observed magneto-electric induction, the action was so feeble that he could only just perceive it, but it is now used on an immense scale in electric furnaces, electric-lighting, electro-metallurgy, and in electro-chemical manufactures. "Straws show which way the wind blows." A small outward sign often indicates a dangerous disease, or a serious defect in a man's character. "Despise not small things, they contain in them the germ of all that is great." "Think nought a trifle, though it small appear; small sands the mountains, moments make the year, and trifles—life" (Dr. E. Young). That which seems at first to promise but little often yields the most in the end. Nearly everything great is made so by gradual accretion, little by little. Both virtue and vice, a good character and a bad one, usually arise from small beginnings.

Time is the great magnifier of minute continuous differences; thus, two pendulums which differ in period of vibration only an imperceptible amount in the course of a minute would differ very greatly at the end of a year. Space is the great magnifier of small differences of direction; a very minute divergence of direction at the end of a mile becomes a very great

one at the distance of millions of miles. Mass is the great magnifier of minute property; the gravitative attraction of a single ounce weight upon another ounce weight is so extremely small that it is almost impossible to detect it, but that of the whole mass of the earth is constantly used in weighing. Whilst the entire globe only attracts a milligramme of water with the force of ·015,423 part of a grain, it would require an attractive force of about 148 tons to pull all the atoms of hydrogen away from those of oxygen in that amount of water (Stallo, "Concepts of Modern Physics," 1885, p. 307).

That the molecular structure and properties of bodies are altered by inconceivably small influences is well-known to physicists and chemists; for instance, in Professor Boys's radiomicrometer, the amount of heat which would fall upon a thermo-electric surface one fourth of an inch square, from a candle $1\frac{1}{4}$ miles distant, is sufficient to produce a manifest electric current; also, in an experiment of mine, I took two small glass cups containing distilled water, connected two small and exactly similar voltaic couples of zinc and platinum wires together in opposition, with a galvanometer in the circuit, and simultaneously immersed them in the liquids in the cups. The two couples being in opposition no voltaic current was produced; but by substituting for the water alone in one of the cups a solution consisting of only one part by weight of chlorine in 500,000 million parts of water, a distinct electric current was produced. It is an extensive truth in physical science, that the first minute fraction in weight of a soluble impurity added to a pure solution, has a much greater proportionate effect than a second one in altering the properties of the pure solution; the second more than a third, and so on; and similarly in the case of melted metals; this phenomenon also agrees with the statement that "first impressions are the strongest."

21. Universal Relation. "Relativity."

All things are relative, none are absolute, but for the sake of convenience we often consider them so; there is no known beginning of time nor limit to space, nor any absolute fixed point in space to which any celestial or other motion can be referred, and as all phenomena exist in time and happen in space, they are all relative; even our thoughts and actions, our ideas of justice and injustice, of morality and immorality, are relative. "There is no absolute material quality, no absolute material substance, no absolute physical unit, no absolute simple physical entity, no absolute physical constant, no absolute standard either of quantity or of quality, no absolute motion, no absolute rest, no absolute time, no absolute space" (Stallo, "Concepts of Modern Physics," 1885, p. 184); "no absolute measure of duration" (*ibid.*, p. 206), "and probably no absolute uniform motion of anything, and probably no body in a state of absolute rest" (*ibid.*, pp. 189, 190); no absolute velocity, no absolute acceleration, and

no absolute position in space. All time is relative to some known event; all direction is relative to the position of some known body; and all motion is relative to some material substance to be moved. There are no perfectly elliptical orbits of the heavenly bodies. Good and evil, knowledge and ignorance, truth and error, are highly relative. It is the relative and not the actual amount of wealth, knowledge, or other possessions of a man that make him rich, wise, or great.

The doctrine of "relativity" is chiefly known as the basis of consciousness (see section 43); it has, however, a vastly wider significance, and is applicable to an immense number of phenomena in inanimate as well as in animate substances. All our sensations, consciousness, and mental perceptions, depend upon change of impression. Perfectly uniform phenomena or existences, such as time, space, and the comparatively uniform ones of the motion of the earth, the pressure of the atmosphere, or the attraction of gravitation, upon us, do not arouse our consciousness; it is a *change*, and especially a sudden and unusual one, which excites our senses and perceptive faculties; "when the mill stops the miller wakes." Similarly, it is not uniformity, but inequality, difference, or change of pressure, which causes a mass to move. It is difference of property of an acid and a base which enables the two to chemically unite; difference of magnetic polarity enables two magnets to attract each other; difference of chemical action determines a voltaic current; difference of temperature gives rise to conduction of heat; differences of molecular structure and of temperature enables molecular motion to produce thermo-electric currents, and in all these cases there are inequalities, and all the phenomena are relative. These and many other phenomena of a similar kind are closely related to those mentioned in section 4.

Variable speed in a machine is well-known to require a greater expenditure of energy to continue it a given period of time, than a regular speed at the same average rate, thus showing a greater expenditure of power when the speed varies, extra power being required to change the rate; the expenditure of energy upon a bicycle driven uphill is not entirely compensated by the gain whilst going downhill.

22. The Immensity and Complexity of Nature.

The entire system of Nature is altogether too vast for the human mind to fully comprehend; the farther we penetrate into space by means of the telescope, the spectroscope, photography, etc., the greater appears the extent of space and the number of bodies within it; the vastly great becomes immeasurably greater. The more penetrating also our scrutiny of the internal constitution of substances by means of increased refinements of the microscope, spectroscope, and of physical and chemical methods of research, the more endlessly minute and complex is the internal constitution of matter found to be, and the incomparably small becomes

immeasurably less. A single molecule of iron has been said to be a far more complicated structure than our entire solar system; equal to a system of moving worlds in every molecule of matter!! But in each case, whether of the infinitely great or the inexpressibly small, a system of order and complex perfection is manifest; and it is only the extremely limited range and power of our faculties which causes us to think that the system of Nature is imperfect. In this ever-continuing extension of the infinitely great, the inexpressibly small, and the endlessly complex constitution of the universe and of the boundless system of truth which represents it, lies never-ending room for mental occupation, progress and improvement of all mankind, an infinite future extension of knowledge and of happiness which all men should welcome, and an unlimited system of truth and power for all men to worship. If science explained all things, the pleasures of progress would cease, and this idea should in some degree console us for our ignorance and suffering.

The sciences of astronomy and geology reveal to us phenomena occupying infinite time, and astronomy those of infinite space; and all the sciences confront us at present with apparently endless mystery upon mystery. According to astronomers, the earth has no less than ten, and its moon "more than sixty" distinct movements. It has been estimated that "close on eight millions of years" would be "the total period occupied by a comet in travelling from Alpha Centauri"—"which, so far as is known, is the nearest star of all in the heavens"—"to the sun" (R. A. Proctor, "The Expanse of Heaven," 1874, pp. 135, 136). Whilst the diameter of the earth's orbit is 183 millions of miles, and the distance of our sun from the earth is about 92 millions of miles, "Sirius is a million times farther away than our sun" (*ibid.*, p. 248); and whilst the sun is 315,000 times heavier than the earth, "Sirius is 1,728 times larger than the sun" (*ibid.*, pp. 14, 245). The solid bodies in space vary in size from the finest dust to globes as large as Sirius. There exist "thousands of millions of stars" (*ibid.*, "Mysteries of Time and Space," 1892, p. 418), or suns in space, and "we must picture the interstellar space which seems unoccupied as in reality tenanted by millions of comets for each one of the millions of suns" (*ibid.*, "The Expanse of Heaven," 1874, p. 140). W. Herschel computed the existence of nearly twenty-nine millions of stars (Marmery, "Progress of Science," 1895, p. 205). It has been estimated that there are "eighteen millions of suns" in the milky way alone. The velocity of motion of matter expelled from the sun is far greater than that of any celestial body, and has been calculated to sometimes equal "four or five hundred miles a second." "More than 300 streams of meteors cross the earth's orbit" (R. A. Proctor, "Mysteries of Time and Space," 1892, p. 131). Meteorites "probably pour in countless millions upon the solar atmosphere" (*ibid.*, "Light Science for Leisure Hours," 1871, p. 20). "By our telescopes, and on our photographs, we can discern something like one hundred million luminous stars in the sky." . . . "The theory of probability declares to us with a certainty that even

within the distance which can be penetrated by our telescopes the visible stars cannot form the hundredth, probably not the thousandth, perhaps not the millionth part of the total quantities of matter" (Sir R. Ball, "In the High Heavens," 1894, p. 246).

> "The reeling brain essays in vain,
> O stars, to grasp the vastness wide."
> —*J. H. Dell.*

The velocity of the earth in its orbit is nearly eight hundred times that of a railway train at a speed of eighty miles an hour.

Matter and space are co-extensive and universal; so far as is known, there exists no space entirely devoid of matter. The smallest measurable space of the most perfect vacuum yet obtained still contains an immense number of molecules of gas, and even interplanetary space is not entirely free from gaseous matter, although its density is almost inexpressibly less than that of the universal ether. The importance of material substance in the universe and to man is extremely great, and all created things are good in themselves. Writers on theology and religion not unfrequently speak in disparaging terms of material substances; for instance, one writer says: "In this discussion I always conceive of matter as absolutely inert—gross—brute" (A. Winchell, LL.D., "Science and Religion," p. 128). Such remarks imply a flattering idea of the superiority of the human mind, and ignore the fact that mental action is essentially dependent upon so-called "base" material nerve-substance; they also disclose deficiency of knowledge of the great truths of science, of the universality of molecular motion, of the extreme complexity of even the simplest substances, etc.

Stellar photography has disclosed to us the fact that there exist in space multitudes of globes which, on account either of their darkness or distance, are invisible to the human eye even when aided by a powerful telescope, and that by exposing to the sky a suitable photographic surface a sufficient period of time nearly the whole of that surface becomes covered with images of these bodies produced by worlds less and less luminous, or farther and still farther distant; so that if we could actually see these bodies as spots of light, the entire firmament would be filled by them, and form a complete luminous surface.

All answers to questions of science lead to more questions, every problem that is solved by means of observations or experiments discloses many others to be solved, so that up to the present time, the larger the number of discoveries that have been made the greater the *apparent* number remaining to be made, and we thus *appear* to be receding from the limits of knowledge, whilst we *know* that we are really approaching them.

"Simplicity, whether truthful or not, is often attractive to unphilosophic minds, because it requires less intellectual exertion. Men like to believe that the universe is framed in accordance with their own simple and crude

preconceived ideas. As the human mind can think erroneously, it is only to a limited extent a true mirror of external nature. Realities often differ from appearances, and the universe of matter is almost infinitely greater and more complex than our common ideas of it. The entire range of Nature is inconceivably great. We cannot even imagine bounds to duration or space, nor do we know limits to the amounts of matter or energy, or to the degree of complexity of physical or chemical actions. To say that duration is finite is equivalent to affirming that there was a period when time was not; and to say that space is not infinite is equivalent to saying that there is a place where space does not exist. Geological considerations and the phenomena of ancient eclipses carry us back towards periods of immense duration; those of astronomy and the revelations of the telescope and spectroscope indicate to us unlimited space and the universal distribution of matter; the phenomena of light, radiant heat, and magnetism, show no limits to the existence of energy; and the microscope, the spectroscope, and the phenomena of physics and chemistry, reveal to us an almost infinite degree of minuteness in the molecular and atomic constitution of substances, and complexity in the action of their forces" ("The Art of Scientific Discovery," 1878, p. 29). It has been calculated that the degree of pressure of the water at a deep part of the ocean is more than 430 tons per square foot.

Two hundred millions of meteors are considered to enter our atmosphere every twelve hours; and Arago calculated that sixty-seven millions of comets frequent the cometary orbits. We all know that the lifeless substances, even upon this globe alone, are quite innumerable; that even the smallest visible grain of sand appears in the field of a powerful microscope like a mass of rock, and is therefore composed of an incalculable number of smaller particles; but as extensive a world of minute things lies beyond the present reach of the microscope as that which that powerful instrument has already revealed to us. Notwithstanding the immense number of natural facts which differ in kind, the number of those which differ in degree is almost infinitely greater, because they shade off into each other by insensible degrees and differences. The number of modifications in the quantitative varieties of inanimate substances, and of rays of energy, such as heat, light, magnetism and invisible radiations, appears to be limitless; and the number of possible mixtures of liquids, metals, and minerals, is incalculable. The immense number of possible alcohols has been calculated by Berthelot (see section 52), and that of all possible chemical compounds and permutation mixtures of material substances must be practically infinite.

"The portion of infinite space which we already know to exist is altogether beyond our powers of appreciation. . . . A cannon ball, moving at its usual velocity, would occupy a year in travelling from the earth to the sun, but would require more than 200,000 years in getting to the nearest fixed star Alpha in the constellation Centauri. Some of the most distant heavenly bodies are so far off that light, travelling at the rate of 186,400

miles per second, occupies more than 2,000 years in passing from them to us; and, for aught we know, there may exist multitudes of solar systems immensely more distant than this. According to Laplace, notwithstanding that light travels at so enormous a velocity, nearly 900,000 times faster than sound, the speed of gravity is at least 50,000,000 times greater," but whether this calculation will be ultimately confirmed is not certain. It has been calculated that light "would require some 20,000,000 years to travel through the whole universe of fixed stars" (Nageli, *Nature*, vol. xvi, p. 534).

"It has been calculated that the number of molecules in a single cubic inch of any gas is about 100,000 million million millions. Each molecule also, in different gases, consists of from two to many atoms, and is believed to be continually moving to and fro at a very rapid rate; for instance, in hydrogen at about 6,055 feet per second, or 69 miles a minute" (Joule). The diameter of a molecule of matter has been estimated to be about $\frac{1}{230}$ to $\frac{1}{300}$ millionth of an inch. According to Dr. Sorby, a $\frac{1}{100}$th of a cubic inch of water contains about 3,900 million million molecules (*Nature*, February 24, 1876, p. 333). A single cubic inch of blood is calculated to contain "about 70,000 millions of red corpuscles." The amount of heat evolved by the sun per second has been calculated to be equal to that produced by the combustion of "16,436 millions of millions of tons of the best anthracite coal" (R. A. Proctor, "Mysteries of Time and Space," 1892, p. 80). Lalande calculated that it would require more than 17 millions of millions of years to bring about the astronomical phenomenon of contemporaneous conjunction of the six great planets of our solar system. It has been further estimated that light would occupy 50,000 years to come to us from the most distant stars visible in Lord Rosse's great reflecting telescope (R. A. Proctor, "Light Science for Leisure Hours," 1871, p. 295). Chladni observed that certain undulations "rushed from the nucleus to the end of the tail of the comet of 1811, a distance of more than 10 millions of miles, in two or three seconds of time" (*ibid.*, p. 18).

"The amplitude of the aerial particles" of sound waves "is less than a 10 millionth of a centimetre" (Lord Raleigh, *Proceedings of Royal Society*, vol. xxvi, p. 248). A wave of light does not exceed one 150,000th of an inch in breadth. In perceiving the sensation of violet colour 707 millions of millions of vibrations are communicated to our eyes in one second of time. It has been truly remarked, "there is every reason to believe, from the spectrum of the elementary substances, and from other reasons, that even chemical atoms are very complicated structures. An atom of pure iron is probably a vastly more complicated structure than that of the planets and their satellites" (Jevons, "Principles of Science," vol. ii, p. 452). According to Angström and Thalèn, pure iron, when ignited to white heat, simultaneously emits rays of light of more than 460 different rates of vibration, and titanium emits even a very much larger number.

"The phenomena of sound and light teach us a similar lesson respecting the inconceivably great degree of complexity even of inanimate substances.

Although the atmosphere is substantially a mixture of only two elementary gases, the smallest portion of it and the universal ether which pervades it, is capable of permitting the transmission at the same instant with but little interference not only of a practically infinite number of rays of light of every different degree of refrangibility, but also of millions of millions of acoustic vibrations emitted by the largest orchestra," and these vibrations do not appear to interfere with the power of the simultaneous transmission by the ether in it of an almost infinite number of rays of heat, and of magnetic and electric induction. Every living thing may be viewed as an inexpressibly complex mass of molecular motions immersed in an infinite ocean of ethereal vibrations."

"The changes produced in bodies generally by alteration of pressure or temperature, even when viewed by the aid of our present very imperfect means and extremely incomplete knowledge of its effects, are often so profound that they point to the conclusion that every single substance may be largely considered as a different one at every different temperature or pressure; for instance, iron, nickel, and manganese are magnetic at low temperatures and non-magnetic at high ones; a red acid solution of a salt of cobalt changes to an intense blue colour by merely warming it; and it is probable that every substance similarly undergoes a great number of molecular changes when gradually altered in pressure or temperature, but we have as yet only detected a few of them," because many of them are invisible.

"We may conclude from these and numerous other scientific facts that we are surrounded on all sides both by phenomena of immense magnitude and by an endless number of others of almost infinite minuteness and complexity" ("The Art of Scientific Discovery," 1878, pp. 29-35). The most complex structure of inanimate solid matter is a crystal; of plant matter, a flower; and of animal matter, the human brain.

> "Oh, who can strive
> To comprehend the vast, the awful truth,
> Of the *eternity that hath gone by*,
> And not recoil from the dismaying sense
> Of human impotence?"
>
> —*Kirke White.*

> "Who can apply the futile argument
> Of finite beings to infinity?"
>
> —*Ibid.*

23. Inertia and Momentum in Human Conduct.

There is inertia and momentum in all human actions, and this is related to the great truth that all actions are dependent upon time; *i.e.*, it requires time for them to increase or decrease, to commence, to continue, or to stop. Nearly every man is conservative and unwilling to change; he

acquires a habit of thought and action. Inertia and momentum operate in the human mind and brain as certainly as in the human body and in solid masses of inorganic matter; for instance, "Not till more than fifty years after publication did Newton's great law secure general acceptance" (Whewell, "History of the Inductive Sciences," vol. ii, p. 198). No one moves until a sufficient impression is made upon him to cause him to act or to think; and it is an undertaking of much greater labour to set in motion the minds of a nation than those of a few individuals. On the other hand, the minds of men when once set in motion tend to continue so, and to run in grooves by habit; thus many men become so accustomed to their particular occupation that they are unable to get out of it; it is related of a well-known pill-maker that when he became old and rich he insisted on being permitted by his successors to visit his business at certain periods in order to see that all things were going on to his satisfaction, and to be paid a small salary for doing so; and a similar tale has been told of a wealthy tallow-melter. Various instances are recorded of man's bodily actions being continued after decapitation, and of headless horsemen leading their troops during the excitement of battle; for instance, during the famous charge at the battle of Reichshofen, immediately after the French Colonel Lacarre gave the order to advance to his cavalry regiment, his head was shot off by a German shell, but his body remained erect in the saddle, and the Germans saw sweeping down upon them the headless colonel leading his regiment. Parliamentary reporters sometimes continue writing during short intervals of sleep (W. B. Carpenter, "Mental Physiology," p. 719). Postilions have been known to sleep whilst riding, and mothers whilst rocking their cradles. It is well-known that many men have continued to maintain expensive residences long after having attained a bankrupt condition, and that great manufactories and other institutions have in many cases been carried on long after their periods of success have passed, largely in consequence of the difficulties of suddenly stopping them. False doctrines continue to exist largely by mental momentum; multitudes of persons continue to hold sectarian beliefs, long after the latter have been proved to be false. It is similar with a nation, after a period of great and too easily acquired pecuniary success, it acquires luxurious tastes, less competent business habits, is less able to compete with more industrious nations, and the momentum of its decline becomes so great that the government is quite unable to stop it; the question of how far this statement is applicable to the present condition of the English nation is worthy of consideration. There is momentum in great "evils" which can only be very slowly overcome. The first law of motion is as true in the subject of morals as in that of mechanics. What is must be until some cause arises to prevent it; under the influences of strong passions men must continue in a career of profligacy; liberated criminals usually return to their courses of crime. By means of unexpended energy and the guidance of persistent cerebral impressions, evil thoughts which are impressed during childhood repeat themselves through life, and bad

habits continue long after their original causes have ceased to operate. When a man has once got into the groove of money getting, he often cannot get out of it, and becomes a mere machine in the process. Good habits as well as bad ones are largely dependent on momentum. Men move with the stream of public opinion, and women with the fashion. The influence of momentum is shown in the well-known "madness of crowds"—"when the world begins to believe extraordinary things," "there is no telling where its extravagance will stop. People, when once they have taken the start, vie with each other who shall believe most" (C. Mackay, "Extraordinary Popular Delusions," vol. i, p. 202). Other animals beside men exhibit the same phenomenon; for instance, sheep; a herd of buffaloes, following their leader, have been known to rush over the edge of a cliff. Vegetables also exhibit it; thus fruits go on ripening after having been removed from the trees. "Evil" must often run its course, because interference makes it worse. The advancing section of mankind do not like to be retarded, and the retarding section do not like to be compelled to advance, because in each case an effort is required to alter the rate; all men are more or less conservative with regard to some of their habits and ideas.

24. Action and Reaction in Human Conduct.

Action is very usually followed by reaction in nearly all kinds of phenomena, both in animate and in inanimate substances; if, however, the action occurs very gradually, the reaction is either gradual, or does not take place, because other conditions are present which prevent it. Nearly everything produces or implies its opposite. Thus, in the phenomena of mechanics, a sudden violent impulse is frequently followed by a rebound, whilst a gradual one is not. "The lowest ebb has the highest flood." Similarly, in medical treatment, a sudden strong purge is often followed by a return of constipation, but a gentle continued one is not. Rest follows exertion, and exertion follows rest, in plants as well as animals. In sociology, also, a sudden violent revolution is followed by a reaction, whilst a gradual change produces a permanent effect; sudden social revolutions do not suddenly cure social evils, but gradual ones do; see what great permanent changes have been gradually wrought in the welfare of mankind by the slow extension of scientific knowledge; a more rapid advance might be followed by reaction. There is incessant action and reaction between nerves and nerve-centres. In the subject of religion fear made the gods, and the gods made men fear (Max Müller, "Natural Religion," 1892, p. 170).

It is evidently the same general principle which exists in all these cases; and, as it is observable in all these varied departments of natural phenomena, it necessarily follows that the other great principles of mechanics, uch as inertia, momentum, acceleration, etc., must also exist in them. It

similarly follows, also from the general principle of action and reaction, that the rate of progress of civilisation is limited, that socialists cannot "hurry up a millennium," and that even the extension of science and knowledge, if it is too rapid, will defeat its own object of doing the greatest good to mankind. "Catastrophes must destroy; but gradual modifications, under the long and silent struggle which never hastes and never rests, preserves whilst it renovates and diversifies the races" (Professor Asa Gray, "Natural Science and Religion," 1891, p. 52). The history of France and other nations has supplied many instances of the evil effects of sudden political revolutions, and fearful warnings of the danger of socialist and anarchist schemes.

All bodies whatever, animal, vegetable, mineral, living or dead, solids, liquids, gases, and the universal ether, act—and are acted upon by—each other, and by their environments, and in the term environments are included the different parts, however small, or however near together or far apart, of the same substance or structure; thus the action of gravity is incessantly from every particle to every particle of the same body, of the nearest and of the most distant ones; thus also the different organs of the human body act and react upon each other without cessation; and similarly, as far as we know, with all bodies whatever throughout all time and all space. Action and reaction occurs in mental, moral, and social phenomena as truly as in the ordinary mechanical ones of inanimate substances. If we injure, neglect, or benefit other persons, they, in return, injure, neglect, or benefit us. Extremes produce each other; the drunkard becomes a teetotaler. An extreme of luxury is apt to produce a desire for asceticism. Love turns to hatred, anger to remorse. "After pleasure follows pain." The taste of bitters excites a desire for sweets. Work produces fatigue both in metals and in men. "When things are at their worst they begin to mend." The nervous and mental excitement attending "religious conversion" naturally produces a physical calm of exhaustion and prostration. Our sensations govern our thoughts, and our thoughts and reason tend to control our feelings. Health of body tends to produce health of mind, and *vice-versâ*.

Ideas produce tears, and tears cause ideas. Attitudes and movements excite the mind, and the mind excites attitudes and movements. Ideas stimulate the senses, and the senses stimulate ideas. Nearly every part of the human body acts and reacts upon every other part through the medium of the nerves. A weak or diseased body depresses the mind, and a disturbed mind reacts upon the body. Nerve influences brain, and brain influences nerve. Material substances act upon the human brain and mind, and the human brain and mind react upon them. The minds of different men also act and react upon each other, thus love excites love, enmity excites hatred, oppression excites resistance, the possession of wealth excites envy, suffering excites sympathy, poverty excites benevolence, etc. New diseases stimulate us to try new remedies. Doubt or scepticism causes inquiry, a feeling of darkness causes a desire for light, a per-

ception of our ignorance excites a thirst for knowledge; without sin there would be no mercy or forgiveness. "Poverty breeds wealth, and wealth breeds poverty." The discoveries made by philosophers help the inventions made by manufacturers, and inventions help discoverers in return. "There is no theoretical discovery that will not sooner or later become practically useful, and there is no practical invention which will not be valuable to theoretical inquiry as serving to explain processes which hitherto we have been unable to understand" (*The Open Court*, No. 42, p. 1032). Necessity breeds invention, and invention excites necessity. By trying to succeed we improve, and by trying to improve we succeed.

Individual morality and public morality mutually stimulate each other. Disuse causes decay, and decay causes disuse. A demand for false promises excites a supply, and a supply of them causes a demand. Whilst an animal is growing its structure is decaying, and the functions of growth and decay act and react upon each other. The use of one's limbs and organs promotes their growth, and their growth stimulates their use. There is a continual conflict between the external discouragements to work and the internal stimulus in us to activity. If a man starves his occupation by insufficient knowledge or tools, his occupation sooner or later reacts upon and starves him. "Our deeds determine us as much as we determine our deeds" (G. Eliot). "Great men shape the age, and the age shapes them." Ignorance produces idleness, and idleness produces ignorance; idleness encourages vice, and vice encourages idleness. Great exertion is followed by great exhaustion. Speak to an excited man, he becomes more excited; poke a blazing fire, it blazes more fiercely. "Like begets like," vice engenders vice, one sin begets another. Some of these cases illustrate the necessity of what we term "evil," and the beneficial effects of conflict.

There is continual action and reaction, and consequently no peace, between savages and civilised men, between ignorance and intelligence, between supernaturalists and scientifics, between teetotalers and moderate drinkers, between sectarians and non-sectarians, between believers and sceptics. There is endless theological animosity between Armenians and Turks, between Catholics and Protestants, churchmen and dissenters, unitarians and trinitarians, high churchmen, low churchmen, broad churchmen. There is continual dispute between so-called "vivisectionists" and "anti-vivisectionists"; between employers and employed; between trade unionists and non-unionists, between those who have and those who have not, the rich and the poor, etc. Every opinion calls forth its opposite; the socialists say "down with the landlords," and the landlords say "down with the socialists." Each grade of mankind finds fault with the next grade above or below it; thus criminals and beggars find fault with the public, labourers complain of their overseers, operatives find fault with employers, unscientific persons disagree with scientific ones; and similarly throughout the series in the reverse order; and unscientific persons are dissatisfied with the powers of Nature, and pray to be relieved from famines, droughts, and other "acts of God."

Each physical, chemical, vital, and mental action, after its first increase, tends by a process of reaction to bring about its own cessation, or an opposite state, sooner or later, it may be in a few seconds or not until after millions of years. A fire burns up to a maximum, and then gradually declines and ceases. The action of a voltaic current tends by polarization to produce an opposite current, in some cases so strong as ultimately to almost stop the original one. The processes going on in a human being during the waking state, after twelve hours, tend to bring about the state of sleep, and the latter after about eight hours reproduce the waking condition. The actions of life similarly, after a certain variable period, differing largely in different living creatures, sooner or later bring about a state of decay and death, and every act of a man brings him nearer to his grave. Some insects only live a few hours; whilst some animals, tortoises, for instance, and carp, live much longer than man; some kinds of trees, the yew for example, live nearly a thousand years, but in all these cases the actions of life ultimately result in a state of death. An abundant harvest of a particular kind of fruit is often followed by one of scarcity. In the course of human life, "when things get to their worst they begin to mend"; things remedy themselves by reaction, the "ups and downs of life" are in accordance with the general principles of action and reaction.

> "As unto the bow the cord is,
> So unto the man is woman;
> Though she bends him, she obeys him,
> Though she draws him, yet she follows;
> Less useful each without the other!"
>
> —*Longfellow.*

25. Acceleration in Human Conduct.

The phenomenon of acceleration of motion operates both with molecules and with masses, in dead substances and in living ones; in mental actions as in purely mechanical ones; we know that a body falling towards the earth increases in velocity every moment, and at a definite rate, the source of energy expended in producing that increase being the "attraction" of the earth. Similarly, the rate of combustion of a fire tends to increase every instant at the expense of the stored-up molecular energy of the combustibles, and will increase until the rate of loss of heat is equal to that of its production; in this way a little spark becomes more or less quickly a large fire; in the case of combustion of gunpowder, as the rate of production of heat is vastly greater than that of its loss, the combustion increases with such great rapidity as to become explosive, and at the expense of the molecular energy stored up in the sulphur, charcoal, and saltpetre. In the self-exciting dynamo also the small amount of residual magnetism in the magnet increases with the velocity of rotation of the armature, the magnet and armature acting and reacting upon each other to

produce the increase at the expense of the mechanical energy of the driving power. A similar phenomenon occurs in the "influence electric machine." A small excitement of the brain often increases to a serious quarrel by a similar process of action and reaction between two disputants, and at the expense of the cerebral energy in each; and in cases where the disputants have been kings and governments, the increase of mental excitement has often culminated in war. Men often go from bad to worse at an increasing rate. Either a man or a nation on the down grade cannot draw back. One falsehood told must be followed by others to support it until quite a fabric of falsehood is formed and a habit of lying is acquired. The beginning of tumult is like the leakage of a reservoir of water, which increases as it continues, until it overpowers all resistance. Infections spread and moral and physical contagions generate and increase at an accelerated rate; as occurred in the spread of the "religious epidemics" of the Middle Ages, the Crusades, and other religious wars.

26. General Compensation. Justice.

Various important statements are true which the great majority of mankind, in the present imperfect state of general knowledge, are unable to believe, and of the truth of which it is almost impossible yet to convince them. One of these is, that each and every man receives full justice for all he does, and is fully compensated for all he suffers; and another is the non-existence of essential evil (see section 37). One great reason for this disbelief is, that many men prefer to believe that which is most pleasant to that which is most true; another is the great complexity of the evidence necessary to establish the above truths, and the incapacity of unscientific men to comprehend it. The great mass of men have little or no time for scientific study or learning, and are compelled to go through life largely heedless of truth and error.

Compensation is a general truth existing throughout all Nature, and is a result of the complex operations of energy in accordance with the great principles of science; and as all natural phenomena, especially those of life and mind, are very complicated, the concrete effect, compensation, is often due to a number of causes, and is a sum total of many items; and in the case of man, is expressed by the sayings:—"Life is worth living," "Happiness is fairly distributed," "There is no advantage without a disadvantage," and many others. And as many of the phenomena of human experience are incommensurable we are unable to sum up their values and strike a balance of pains and pleasures.

As, however, the whole of Nature, animate and inanimate, is governed by exact and immutable laws, it necessarily follows that Nature balances every action, and that complete justice and compensation are ultimately accorded to all living things. The principle of action and reaction exists in every phenomenon, each disturbance of equilibrium is followed by its

own corrective; pleasure is largely proportioned to pain, loss to gain, and punishment to wrong-doing; sooner or later, good deeds are rewarded by peace and pleasure, and bad ones are followed by pain and punishment. Compensation to human beings must necessarily be an extremely complicated subject; first, because it is composed of so many complex elements; and second, because its items are often incommensurable and their relations to each other are continually changing. But the energies of Nature, in accordance with their laws, are incessantly balancing up each man's account, debit and credit, for and against, with incomparably greater accuracy than he could do it himself, and in a variety and multitude of ways which he is unable to understand or appreciate. Man is largely unable to value his own deserts, because he much more easily forgets the advantages and pleasures he has received than the wrongs and pains he has suffered; whilst he feels the heaviness of his duties to others he less fully appreciates the burden he puts upon them; he willingly receives from his ancestors, but unwillingly gives to his successors; he readily accepts advantages, but hesitatingly gives others in return.

The general truths of compensation and essential justice have their basis in the inmost properties of substances, and are in a measure implicitly contained in the logical axiom, "a thing cannot be and not be," and in the statement "contradictories cannot co-exist." No substance or being in Nature, whether living or dead, can possess every kind of property, it cannot possess incompatible ones; the very presence of one property excludes that of its opposite, for instance, heaviness excludes lightness, hardness excludes softness, brittleness excludes toughness, transparency excludes opacity, a good conductor cannot be a good insulator to the same influence, and so on; thus, the absence of one property or advantage in a substance is often compensated by the possession of another, and must be so. And so it is with man, he cannot have all he wants, he cannot both have and not have a particular quality or ability, he cannot possess contradictory attributes; all the qualities of men are never found concentrated in a single man, thus strength excludes weakness, knowledge excludes ignorance, riches exclude poverty, truthfulness excludes falsity, belief in science largely excludes belief in superstition, and so on. In consequence of the fundamental scientific truth that contradictory properties cannot co-exist in the same substance, no man can possess every advantage; with nearly every advantage he has to accept and submit to some disadvantage;—for instance, "after pleasure follows pain," and after pain comes the pleasure of relief from pain; after toil comes the ease of rest; "health waits upon industry"; knowledge and its advantages compensate the labour of self-training; industry and economy are compensated by the acquisition of wealth; the pleasures of power and riches are sometimes detracted from by an unhealthy body or by an accusing conscience; blindness is partly compensated by increased powers of feeling and hearing; affliction is largely balanced by sympathy. After one very heavy trial small ones are less felt. The advantages of wealth are partly compen-

sated by the hypocrisy of false friendship and the envy of poverty; those of knowledge by the hatred and envy of ignorance; "where ignorance is bliss 'tis folly to be wise." All these examples show that the saying "all men are equal before God," has some degree of truth in it; and many of these phenomena breed their opposites in accordance with the general scientific principle of "action and reaction." Compensation often makes life worth living. In accordance with the general truth of compensation, happiness is pretty equally distributed among men, to the poor and to the rich, and to the middle class; to the private individual as well as to the public one; for all positions in life have their drawbacks, "uneasy lies the head that wears a crown";—and "very few monarchs die in their beds." As stated above, all these phenomena may be traced backwards and shown to have their origin in the most fundamental and hidden properties of substances; there are, however, many abstruse and complex cases of compensation difficult to explain; and many cases where the apparent advantages more than counterbalance the apparent disadvantages, and many others where the reverse occurs; many where the "evil" is less than the good, and many where it is greater, but such cases require to be more comprehensively viewed.

The following quotation illustrates the principle as it sometimes occurs in natural history:—"In 1878 Mr. Bancroft Espeut imported the Indian mongoose into Jamaica for the purpose of destroying the 'cane-piece' rat. Ten years later it was estimated that the saving to the colony through the work of this animal amounted to £100,000 annually. Then came a sudden change in the aspect of affairs. It was found that the mongoose destroyed all ground-nesting birds, and that the poultry as well as the insectivorous reptiles and batrachians of the island were being exterminated by it. Injurious insects increased in consequence a thousand-fold; the temporary benefits of the introduction were speedily wiped away, and the mongoose became a pest. Domestic animals, including young pigs, kids, lambs, newly-dropped calves, puppies and kittens, were destroyed by it, whilst it also ate ripe bananas, pine-apples, young corn, avocado pears, sweet potatoes, cocoas, yams, peas, sugar-cane, meat, and salt provisions and fish. Now, we are told, Nature has made another effort to restore the balance. With the increase of insects, due to the destruction by the mongoose of their destroyers, has come an increase of ticks, which are destroying the mongoose, and all Jamaica rejoice" (L. O. Howard, *Nature*, October 21, 1897, p. 604). When a crop of wheat is below the average in one country, it is often above the average in another. A year of scarcity of one kind of fruit is often one of abundance of another kind.

Every improvement in science and every advance in civilisation is usually accompanied by what we term "some drawback," some "evil"; for instance, the getting of coal, ironstone, limestone, lead ore, copper ore, marble, slate, clay for the manufacture of bricks; the processes of iron-smelting, copper-smelting, the manufactures of washing soda, nickel, phosphorus, pottery, etc., are attended by accumulations of great heaps of

rubbish, which are often a great eyesore and offence. The manufacture of chemicals is often attended by noxious fumes; that of metals and all kinds of metallic articles, usually by great noise and smoke. The concentration of intellect in great cities is accompanied by an impure atmosphere, destruction of vegetation, contamination of the water in wells, accumulation of vice and other "evils." The advantages of railways are accompanied by disfigurement of natural scenery, the shrieking of locomotives; the rattle of trains, the noise and hurry at railway stations; every railway has its unsightly embankments and cuttings, its ugly bridges and telegraph wires, its gloomy and offensive tunnels. And a large proportion of these drawbacks depends upon the scientific axiom that contradictories cannot co-exist, and upon the law of causation that causes must produce their effects. Many other examples of the action of natural compensation might be adduced; Longfellow's poem entitled "The Birds of Killingworth" is one.

27. Conservation of Matter and Energy.

Of the creation or annihilation of matter we possess no reliable evidence. In former times it was believed that "God created the world," that matter could be formed out of nothing, and that it was destroyed or annihilated by combustion; it is, however, now well-known that no man has ever created or destroyed the smallest particle of any substance. This knowledge has been acquired nearly wholly by the labours of chemists, who have abundantly demonstrated that when wood or coal burns and disappears it simply unites with the oxygen of the air and escapes as an invisible vapour or gas, the weight of which is exactly the same as the united weights of the combustible substance and the oxygen used to consume it.

We know that when two substances chemically unite they lose some of their original properties, but not their weight. For instance, 23 parts by weight of sodium and $35\frac{1}{2}$ of chlorine, unite together to form $58\frac{1}{2}$ of common salt; that sodium is a very soft ductile metal, white and brilliant like silver, but very much lighter, and if placed upon the tongue it would immediately produce flame; that chlorine is a yellow, suffocating, poisonous gas; that common salt is very different from either, and is a necessity of human existence; in it, however, the two substances still exist, and can be extracted from it in exactly their original weights. Similar results have been obtained with multitudes of other substances. So far as we know, the whole of the matter and energy in the universe is a fixed, unchanging quantity, and that they exist throughout all space. Professor Landolt could not detect any perceptible difference of weight of two substances before and after chemical union. It may be truly said by matter or energy—"I change, but I cannot die."

If matter is never destroyed, as it certainly is not to any appreciable

extent, it agrees with the scientific conclusion that the materials of which our bodies are composed have previously formed parts of the bodies of other men and animals, and will again form parts of men and other animals who come after us. This general truth renders the materialistic theory of "resurrection of the human body" a highly irrational one; and it fully agrees with the fact that the bodies of dead men are never seen to rise again, and with the one that there has been no "Second Advent of Christ," or of any other person.

> "Nothing that is shall perish utterly,
> But perish only to revive again
> In other forms, as clouds restore in rain
> The exhalations of the land and sea."
>
> —*Longfellow.*

It is only in comparatively recent times that the further great truth has been discovered by physicists, that we never either create or annihilate energy; that when it appears it comes out of some substance in which it previously existed in a "potential" or stored-up state, usually in the form of incessant molecular motion, and that when it disappears, it is only transferred from one body to another, and its total quantity remains the same. As an illustration of this, it has been proved by quantitative experiments that a pound of ice during the act of freezing parts with exactly the same amount of heat as it absorbs during that of melting; and that the quantity of heat absorbed during the chemical separation of any metal from its oxide is exactly the same as that which it evolves during its reconversion into that oxide. From a great number of measurements similar to these we know that energy is not destroyed nor created in any appreciable degree.

Although we cannot create nor annihilate matter or energy, we are able to transform the properties of matter by chemical union and disunion, and change one form of energy into another, and such transformations and changes are continually occurring in Nature, in animals, and in artificial processes: thus the heat and light of the sun are continually being transformed into vital energy in plants, and into potential chemical energy, which may subsequently be again changed into heat, by combustion of the plants in fires, or by a slow process of combustion of them in animal tissues after having been eaten as food. Animal and vegetable life; the change of solids into liquids, liquids into gases, gases into liquids, liquids into solids; the formation of crystals; all chemical changes, whether of union or disunion, decomposition, and a vast number of electric and magnetic changes, actions of light and heat, and of mechanical phenomena, are attended by transformations of forms of energy; and we believe that chemical energy in the brain is transformed into mental power; and in other parts of the body into heat, vital and muscular energy.

Just as the amount of available stored-up magnetic energy in a piece of iron is increased by increasing its distance from a magnet, so is that of

available gravitative energy increased by raising a body from the earth; and this has been termed "potential energy of position"; the energy however is not caused by "position," but is imparted to it during the act of lifting, and is attended by alterations of molecular or atomic motion in each of the two bodies; it varies inversely with the strength of the "attraction," and as the square of the distance of the two bodies asunder; with increase of distance molar energy is changed into molecular, and with decrease of distance the reverse. Energy, whether stored up in a potential state, or during the act of transmutation, is of immense value to mankind; the active energy of the Niagara Falls has been estimated as being equal to about fifteen million horse-power, and is now being extensively utilised. Nearly all the physical and mental actions of men are instances of transmutation of energy.

28. Equivalence of Energy.

It has been discovered and proved that the different forms of energy known as mechanical motion, heat, light, electricity, magnetism, chemical power, etc., are not only all mutually convertible into each other, but that the quantity of one form of energy disappearing is exactly equivalent to the amount of that into which it is changed; for instance, the mechanical energy of one pound weight falling through a distance of about 772 feet can produce, and is equivalent to, the amount of heat required to raise the temperature of one pound of water one Fahrenheit degree. It is well-known that the amount of stored-up energy in a piece of good coal would be sufficient, if wholly converted into mechanical power, to lift its own weight quite twenty-three hundred miles; but in the best steam-engine we only obtain about 13 per cent. of this, the remaining 87 per cent. being lost in various ways. A single cubic mile of the sun's radiations at the surface of the earth has been calculated to be equal to the amount of mechanical energy required to lift 12,000 pounds one foot high.

It is perfectly consistent with all known truths, and has been fully verified or rationally inferred in numberless cases:—1st, That effects are produced by causes; 2nd, That causation is universal; 3rd, That effects are equal to their causes; 4th, That all motion or energy arises from previous motion; 5th, That one form of motion is capable of being transformed into others, such as rectilinear into circular, vibrating into circular, constant into intermittent, etc.; and 6th, That motion or energy is neither created nor destroyed in any case. If we admit these, it necessarily follows that in every case where one form of energy disappears and another appears, the amounts of the two forms must be equivalent to each other. But there are many devout persons who, without possessing suitable and adequate knowledge, deny the universality of natural causation, and insist upon the production of energy by means of "Divine will" and other occult causes, without adducing proper and sufficient evidence to prove

it, and heedless of the habit of untruthfulness they thus acquire, and of the fact that unprovable sectarian beliefs lead to "religious atrocities."

Not only the great truth of equivalence of energy, but all the foregoing principles of universal causation, continuity, and dependence, together with those of universal molecular motion, relativity of action, inertia, action and reaction, conservation and equivalence of matter and energy, etc., are in harmony with the phenomena of all animate and inanimate bodies, and as far as we know or can logically infer, at all times, in all places and circumstances, and with men's physical, physiological, mental, moral, social, and religious actions; and if this statement be correct, no hypothesis of an occult, supernatural, or ultra-rational power are necessary in order to explain human thoughts or conduct. It is a generally admitted truth that the amount of influence which a man has upon his fellow-men is directly proportionate to his mental and physical energy; Newton and Luther are examples of this; and that wealth, social, political, and military position have great influence.

29. Dissipation and Restoration of Energy.

It is well-known that the heat emitted by bodies tends to diffuse itself throughout space, that all bodies in a given volume tend to acquire the same temperature, and that when they have acquired that condition the heat contained in them is incapable of producing mechanical power. It is also well-known that portions of the forms of energy, called mechanical, chemical, and electrical, are continually being converted into heat, and that this heat and that of the sun is constantly being dissipated into space by radiation, and when it has become equally diffused it ceases to be a source of mechanical power. This general truth has given rise to the theory of "dissipation of energy," or an ultimate production of perfect equality of temperature throughout the universe.

We know further that heat is evolved by contraction of volume of substances, the liquefaction of gases, the solidification of liquids, the collision and friction of masses and of molecules, the chemical union or combustion of substances, etc. As heat is largely set free by the condensation of gaseous nebulæ, by the gradual contraction of volume of the heavenly bodies, by the incessant fall of small bodies, such as meteorites into suns and planets, by burning suns or stars, by molecular friction in their constituent substances, by friction of masses, such as that of meteorites in passing through the air, and the friction of winds and tides produced by celestial influences, it would be necessary in order to attain a perfectly uniform temperature throughout all space, not only for all the hundreds of millions of suns or stars to cease contracting in volume and to discontinue burning, but also to cease moving in their orbits and upon their axes; and this would entail a condition of perfect stillness and darkness throughout the universe. As the hypothesis of universal dissipation of energy necessarily

includes such vast changes as these, it is worthy of consideration whether it may not be founded upon incomplete evidence, and whether additional knowledge may not be acquired in the future which will enable a more consistent hypothesis to be framed. The entire experience of mankind has been that of incessant change of all bodies, and of never-ceasing motion of all the masses and molecules in the universe. A state of balance has succeeded change, and change has succeeded balance everywhere and in every substance; and it is therefore probable that if the entire universe was to gradually "run down" and assume a perfectly balanced, uniform, motionless, and lifeless state, it would again gradually become active in course of time. As in all known cases, life succeeds death and activity follows stillness, so may it possibly in this one.

We know that so far as this earth is concerned, the process of "dissipation" is accompanied by a storing-up of energy; that whilst the sun is losing heat the earth is storing it up in a potential state by means of living vegetation; and that as long as vegetable life continues, heat will continue to be stored up as it is now, and may be liberated at any future time under suitable conditions. We know also that as long as gravitation continues it will produce earthquakes, terrestrial strain, and their heat of friction; and that as long as the motions of our sun and moon continue they will produce tides in the atmosphere and in the ocean, and those tides will, through the medium of friction, continue to produce heat and inequality of temperature. Similar remarks respecting the storing up of heat by means of vegetation, and the production of heat by means of gravitation and tides, may be true of multitudes of other heavenly bodies besides our earth. Motion of masses, and molecular motion or heat, are mutually and inseparably related; a mass cannot either approach or recede from another mass without the molecular motion of each being altered; this is well-known to occur with magnets and with certain other bodies; all substances influence each other's movements and temperature by means of gravitation; when masses separate their molecular motion increases.

It is apparently true that nearly all the visible celestial bodies are contracting in volume, "attracting" to themselves meteors, etc., and evolving and dissipating heat and light by these actions, and that there is at present but a comparatively small amount of evidence of an opposite process occurring; nevertheless, it would be strange if such a counterbalancing action does not extensively exist in the multitudes of non-luminous bodies distributed throughout space. It may also be remarked that it is the most luminous orbs which are losing most heat; and these are the most conspicuous ones; whilst it is the non-luminous ones which are receiving most, and those are the least conspicuous, so that we are more liable to notice the loss, and less apt to observe the gain and the storing up of energy than the reverse.

It is certain that the whole of the radiant heat which is being diffused through space must, if it radiates far enough, fall upon some celestial bodies, and that, if it fell upon vegetation, it would be stored up in a

potential state without raising the temperature of the body; and as recent photography has revealed to us the existence of multitudes of dark worlds in space which are quite invisible to us even by the aid of the telescope, vegetation on those dark worlds may absorb a large amount of heat, and retain it in a potential state without our being aware of it.

Perfect dissipation of heat of all celestial bodies, both luminous and dark ones, would require all the gases and liquids in the universe to be condensed into solids at the absolute zero of temperature, to have ceased all chemical action upon each other, and to have ceased all contraction and the consequent evolution of heat; it would require also not only the cessation of all motion of masses but that of all molecules, because we know that the mere presence of bodies near each other gradually alters their properties; and it would further require the consolidation of all the matter of the universe into one cold mass. We may, therefore, treat the idea as an hypothesis useful only for comparison with the most comprehensive evidence obtained by future research.

30. The Properties of Substances.

The general properties of all substances and bodies, animate and inanimate, depend upon their composition and upon their structural arrangement, those of elementary substances being results of the less complex but more recondite movements of their atoms and molecules. With identity of composition, structure, and molecular motion, there appears to be in all cases identity of properties—thus, one particle of gold cannot be distinguished from another. The properties of copper, its colour, ductility, conductivity, etc., depend upon its atoms and molecules and their internal arrangement and movements; those of oxide of iron upon the iron and oxygen of which it is composed, and their structural arrangements as modified by chemical union; and similarly with all other elementary substances and compounds. The properties of a body are usually permanent unless the composition, structure, or molecular movement of the body itself is altered. Those of a complex mechanical apparatus, such as a steam-engine, or a dynamo, similarly depend upon the collective properties of the substances composing it, and their mechanical and other structural peculiarities. Those of a living vegetable or animal, ditto, and upon the mechanical, physical, chemical, and physiological conditions present; thus, the properties of a man may be considered to be the collective properties of all the substances of which he is composed, and of the mechanical, physical, chemical, and vital properties of all his parts. Nearly all the chief properties of living things, except that of simultaneous and continual interstitial growth and decay, are to be found in inanimate mineral substances. The elementary substances, with their atomic and molecular motions, must necessarily contain potentially in some form the fundamental properties of all the substances, animate and inanimate, in the universe, otherwise they

could not impart them to the bodies composed of them, and animated bodies could not be formed out of inanimate substances; the secondary properties alone being due to the new structures. We only know a substance by its properties, and if property *is* substance, if we change the property we can so far change or convert the substance; the most notable instances of this kind yet known are the changes of diamond into charcoal, and white phosphorous into red. It is asserted that, by application of great pressure and cold, silver has been turned into gold.

All living substances whatever possess physical properties, their chemical ones being added to these, and their vital properties being superadded to their physical and chemical ones; thus, a living substance cannot possess vital properties without also possessing physical and chemical ones, whilst if vitality be destroyed many of the more elementary properties remain. The property termed life or vitality is therefore an addition to, and is dependent upon, the simpler physical and chemical ones, and may be considered to be evolved or differentiated out of them. As the physical properties of bodies are due to, and dependent upon, the composition and arrangements of their atoms and molecules, so the other properties are dependent upon, and due to, all of these; and the vital properties are similarly dependent upon the atomic and molecular composition and arrangement, and upon the physical and chemical properties of the substance in which they occur, and in addition upon a continual change of these. Thus, in order to fully understand the vital function of blood, we require not only to know its atomic and molecular composition, its physical properties, and its chemical ones, but also to comprehend the continual changes going on in all of these upon which its vitality depends, or of which it actually consists.

Just as the characteristic property of a steam-engine or of a windmill or watermill is to produce mechanical power, and of a dynamo to produce electric current, so the chief property of a stomach is to digest food, of a heart to pump blood, of a lung to breathe; and as that of a bone is rigidity, and of a joint is flexibility, so that of a muscle is contractility, of a nerve irritability, and of a brain to perceive, think, and direct; and so on, similarly of all the structures and tissues of living things and of the different parts of inanimate ones. As also a magnetic substance, such as iron, cobalt, nickel, etc., can only be excited by a magnet or an electric current, so the nerves of sight, hearing, smelling, tasting, touch, hunger, thirst, etc., can only be excited usually by their appropriate stimuli, light, sound, odour, flavour, mechanical contact, etc., and the brain can only be excited by a stimulant coming from a nerve; it is well-known to physiologists that the brain of a live animal may be cut away in slices without producing pain.

The needs of inanimate things, and the wants and desires of animate ones, largely merge into each other, and so do the properties of animals and vegetables. "Vegetable physiology approaches very nearly that of animals. Like them, plants exhale moisture abundantly by their whole surface"; "a man loses 2·2 pounds avoirdupoise of watery vapour from

his skin in twenty-four hours," but for equal amounts of surface the loss of moisture by the sunflower is seventeen times as great (F. A. Pouchet, "The Universe," 13th edition, pp. 297, 299, 301). Some plants have their periods of sleep similarly to animals, and appear very different during the night from what they do during the day (*ibid.*, p. 325). Many flowers close every evening in consequence of changes of light, not of temperature; and the phenomenon is particularly noticeable in the *Leguminosæ*, and most of all in the sensitive plants (*ibid.*, pp. 326, 327); electricity kills some of them, narcotics paralyse them, opium sends some to sleep, and prussic acid kills them at once. At about dusk in the evening the flowers of the cactus suddenly open and expand from the size of a button to about four inches diameter, and temporarily evolve a strong odour of vanilla (*ibid.*, p. 331). The Semaphore plant (*Desmodia oscillans*) is also very sensitive to light, and so are even its branches and leaflets after having been cut off it (*ibid.*, p. 332). The *Mimosa pudica* is extremely sensitive, not only to light and shade, but also to contact and sound; and much more so to either an increase or decrease of motion and sound than to its uniform continuance (*ibid.*, p. 331), and in this respect is very similar to a human being (see section 44). Notwithstanding these rudimentary signs of consciousness, "the existence of nerves in plants may still be matter of doubt, but it is none the less certain that the irritability shown by the sensitive plant seems to be under the empire of organs analogous to nerves" (*ibid.*, p. 332). These and other facts show that the properties of plants are not entirely distinct from those of animals.

31. Persistence of Property of Substances. Heredity.

This is a general truth or principle which has not received the degree of attention it deserves, because it is in many cases largely obscured by circumstances. With regard to it we know:—(1) that the *mass* of a substance is indestructible, or so nearly that no loss of it by chemical union or otherwise has yet been perceived (see section 27, p. 108), and that it passes with a substance into the whole of its compounds, and through all their changes; (2) that the weight of it is also invariable and persistent if taken at the same place and distance from the earth; (3) that heavy metals and their oxides usually form heavy alloys or heavy salts, the property of greater specific gravity being largely transferred with the metals into their compounds, thus the salts of lead are usually heavy, and those of lithium usually light; (4) that magnetic metals often form feebly magnetic salts, the property of magnetism being frequently transmitted; (5) that coloured acids usually form coloured salts, the colour also being transmitted; and (6) that various other minor properties are occasionally transferred, but in a less conspicuous degree. These facts are sufficient to show that whilst the most essential properties of substances are completely carried by the substances into their compounds, the less essential ones are not so com-

pletely or so frequently transmitted. Every scientific person knows that the mass or weight of a stone, a tree, or a man, is invariably the collective mass or weight of all the substances of which it is composed; but when we examine the less fundamental phenomena of bodies, the principle of persistency of properties is more obscure, thus the transference of high specific gravity is more variable, and that of magnetism, cohesion, and colour, still more so, and the still less fundamental properties in many cases seem to entirely disappear during chemical union, especially when inanimate substances unite together to form the very complex structures of living tissues. The original secondary properties of substances disappear during chemical union largely in proportion to the degree of strength of such union, and the complexity of the compound or structure which they form, thus whilst a mechanical mixture of finely powdered carbon and sulphur has the entire mixed properties of its ingredients, the chemical compound of them is a colourless volatile liquid, nearly wholly different from the original substances, except in mass, weight, and combustibility; the combustibility being largely increased. In cases of chemical substitution also, where one substance and its properties takes the place of another, there is a similar partial disappearance of one set of secondary properties and appearance of another; for instance, if lead is substituted for mercury in vermilion, the red colour is replaced by black.

A mass of matter may be regarded as a collection of molecular motions, and we believe that the properties of bodies are due to those motions, and may be regarded as their representatives. We know that molecular motion or energy, like motion of the mass, may be transferred from one substance to another; that when two substances unite chemically together, some of the molecular motion is usually lost in the form of heat, that a more or less new set of molecular movements and properties appear in the new compound, and that these new movements and properties are consequences, and, to some extent, representatives, of the old ones. And as all chemical changes occur in accordance with the general principle of equivalence of energy, if during an act of chemical union, or of substitution, molecular energy is lost or gained, the molecular energy of the new compound, plus or minus the energy gained or lost, is equivalent to that which existed in the two substances previous to the change. If we view the new molecular movements and properties acquired by substances when they unite with each other as strict results of those possessed by the original bodies, as indeed they must be, we may say that the properties of vermilion are results, and to some extent, representatives, of those of its constituents, sulphur and mercury, notwithstanding that vermilion is red whilst sulphur is yellow and mercury is colourless, and we may similarly say, notwithstanding the great differences in the properties of chlorine, sodium, and common salt, that the properties of the latter compound are undeniably results of those of the previously existing chlorine and sodium when in an uncombined state. Continuing this legitimate mode of reasoning, we may say that the properties or characters, even of animate substances, are

results of those of the inanimate ones of which they are composed, and that the properties of every minute part of a living creature, such as a man, are results of those of the materials or food of which it is composed, and are the properties of the living substances in their particular states of chemical and physical union. We know that nearly all the food we eat is combustible, and that it carries with it its combustibility into our structure, and is to a large extent burned within us to produce heat; we know also that it possesses the same weight whether it is in our body or out of it. "Man is what he eats."

That individual substances, both acids and bases, metals and metalloids, do carry some of their properties which are not usually considered fundamental ones, without diminution, through a whole series of their compounds, is a well-known general truth in chemistry; for instance, sulphuric acid in union with oxide of silver may be transferred to the oxides of copper, cadmium, zinc, magnesium, lithium, sodium, potassium, rubidium, etc., in succession, so as to form sulphates of those metals and in every one of these compounds the sulphuric acid retains without diminution its original property of giving a white precipitate on addition of a solution of nitrate of barium. Similarly, hydrochloric acid in union with oxide of mercury may be transferred to copper, cadmium, zinc, magnesium, lithium, sodium, etc., and carries with it through all these compounds its property of giving a white flocculent precipitate, with a solution of silver nitrate; and if the chloride of sodium is used as a condiment with food, it similarly carries its properties into the living blood, and may by similar means be detected there, and subsequently in the urine, perspiration, and tears. But if the compound, at any stage of its career, is profoundly altered by some other chemical change, and a new one thereby produced, as when a chloride is changed into a chlorate, the new set of secondary properties are transmitted in all the succeeding combinations in a similar manner to the old ones. Many other examples might be adduced, but these are sufficient. Inheritance of similar substances therefore entails, to a certain extent, inheritance of similar properties and characters, both in animate and in inanimate bodies; and in each of all such cases as the above, the phenomena of inheritance and of family likeness distinctly occur, and support the general conclusion that the properties or characters of a man are those of the material substances of which he is composed, and to some extent of those of his ancestors. The phenomenon of heredity has been observed even in microbes; it has also been observed in iron and electro-magnets; thus "the magnitude of the electro-magnetic torsion" of a wire or rod of iron "produced by a given current depends not only upon the kind of current which immediately precedes it, but also upon the description of current which precedes that one" (*Philosophical Transactions of the Royal Society*, vol. clxiv, pp. 543, 556); or in other words, the properties of a magnet are not only affected by its immediately preceding state or property, but also by that of its predecessor, and so on. "Every piece of steel has its

idiosyncrasies." "Every magnet has individual characteristics" (J. Trowbridge, "What is Electricity?" 1897, pp. 33, 35). Heredity appears to be universal in crystals; for instance, however many times crystals of common salt are dissolved and re-crystallised under exactly the same conditions, the crystals are always in the form of cubes possessing all the same characters. If, however, the conditions are altered, the form of the crystals are slightly modified in their minor properties. A similar statement is true of a multitude of other crystalline substances. Nageli, in the year 1860, stated that "the species is contained in the egg of the hen as completely as in the hen, and the hen's egg differs from the frog's egg as widely as the hen from the frog" (J. A. Thomson, "The Science of Life," 1899, p. 116). It is consistent with the theory of heredity that, by continual division of cells into new ones, all the animal structure is built up, and thus contains in every part a portion of each of its parents (Van Beneden; Huxley).

32. Resistless Power of Universal Energy.

According to the law of causation, "whatever is must be," and this is true of all things living or dead. We all do as we must, *i.e.*, as we are caused. Starvation compels a man to steal, and the necessity of protecting our property compels us to punish him. Ask any man why he did a particular wrong act, and in nearly all cases the reply given is that he was compelled to do it by the circumstances; and in the few exceptional cases the cause was not observed. The necessity of an event is often shown by the fundamental character, variety, number, and magnitude of the causes which excite or produce it, and general compulsion may be regarded as a sign of the existence of a general law to express it.

Nature controls men, and not men control Nature, as some persons imagine, except to a very minute extent, the difference of energy on the two sides being so extremely great; for instance, if a man jumps upward one foot, he only pushes downwards the earth about one 120,000 million million millionth part of a foot, and this proportion may be considered to represent the mechanical power of a man to that of the earth. Hence when men wish to effect objects, they must first adapt themselves to the energies and conditions which govern them in the particular case. The destinies of great nations are not essentially settled by the decisions of kings or their ministers, but by the great forces of Nature acting through them, and if the human decisions contradict natural laws, they cannot be successfully carried out; neither emperors, statesmen, popes, religious sects, socialist organisations, nor even nations, however powerful, are able to successfully resist the causes which determine the progress of evolution and civilisation. The results of the conflict of theology and science form an instance of this, and science, although so comparatively feeble, has ultimately been the victor in nearly all cases, because it has been more

obedient to natural powers. Like moths flying into a flame, or confined animals striking themselves against the walls of their cages, so human beings, ignorant of the omnipotence and universality of the great natural energies which govern them, are continually trying to resist or evade them, trying to persuade themselves that they are more important and stronger than they really are—that falsehoods are true; and the consequence is, they sooner or later are punished. No man, nor even a nation, can neglect or defy omnipotent power with impunity.

The great forms of energy are almost infinitely stronger than all mankind; thus, the entire population of this globe, amounting to about twelve hundred millions, are fixed to the earth by the power of gravitation, and cannot get away if they would; they are incessantly carried through space at a rate of about eighty-four thousand miles an hour, whether they are willing or not, *i.e.*, one thousand miles an hour by rotation of the earth on its axis, 67,000 miles per hour in its orbit, and 16,000 miles an hour by motion of the solar system through space, or 84,000 if all three directions coincided. The moving power of so great a mass as that of the earth is almost incomparably greater than the muscular power of all its human inhabitants. All men and other animals are compelled by those powers to eat and drink and breathe in order to live; and they must either keep moving or die; they are only permitted to live a limited number of years, and must then return as dead matter to the earth of which they were originally formed. Willing or unwilling, all men must run the risks and endure the calamities which they cannot prevent or foresee, such as railway accidents, shipwrecks, floods, avalanches, tempests, blizzards, fires, explosions, the great heat of summer and extreme cold of winter, lightning, famines, dearth of water, scarcity of coal, pestilences, disease, fraud, robbery, violence, revolutions, strikes, and lock-outs; they must also support criminals and paupers, the cost of war, endure the constant presence of vice, pain, and misery, etc. It is largely useless for either governments or nations to resist the influence of natural powers however painful their effects may be; they can only obviate some of them by means of obedience and knowledge. It has been calculated that over 3,000 millions of human beings are born and die during each century (Laing, "Modern Science and Modern Thought," pp. 183, 221). Under the influence of irresistible energy whole races of men and other animals have died out; the Aztecs, the Toltecs, the Mandans, the Maoris, the Australian aborigines, numerous antediluvian animals, the Saurians, the Mammoths, etc., have entirely or nearly entirely vanished, and many others, such as buffaloes, elephants, and the carnivora are fast disappearing. With all these evidences (and a multitude more) of the action of omnipotent forces upon man, it would be strange indeed if there existed "no science of human society." It would be still more strange if the great powers which govern the vast globes in the heavens, and keep them revolving at enormous speeds in their orbits, were not strong enough to control the actions and movements of insignificant creatures such as men, the mechanical energy of the whole of whom is only about 100 million millionth that of the earth.

33. Decay of Nations, Families, etc.

A nation is a collection of individuals; with it therefore, as with a man, if it has a single fundamental defect, and neglects to apply remedies in time it gradually decays; permanent neglect of any one of the chief rules of morality is sufficient to ruin any nation. A man who does too much for the advantage of himself and his family and too little for the good of others, usually sows the seeds of family decay; the energies of Nature punish his descendants for his neglect; similarly with nations, thus deficiency of industry and knowledge, combined with attempts to force an alien religion (Roman Catholicism), upon the Mexicans and Peruvians, sowed the seeds of decay of Spain and Portugal.

The Englishman's predominant failing is too great love of wealth and amusement with too little faith in knowledge. When football teams go to Canada and Australia for the sake of amusement; when 50,000 persons go from all parts of the country to Liverpool, and to the Crystal Palace at Sydenham, to see such a relatively unimportant event as a football match, and the winners are received on their return by thousands of admirers with bands of music, and fêted and treated as important persons who had done their fellow-creatures and their nation an important service, it is a sign that the wisdom of the public mind is weakened. "Footballing is nearly as demoralising as prize-fighting." It is easy to perceive that young men have much more amusement and athletic exercise than is necessary for their bodily and mental health. Small ideas and occupations are "run mad." We expend yearly an estimated sum of "£38,000,000" on sport (*Journal of the Society of Chemical Industry*, vol. xv, p. 506). The popular cries by young men and the working classes in England are now for more wages, more amusement, fewer hours of work, and therefore for less industry. "The immense majority of those whose names are before the public as the leading amateur exponents of sport are capable of better things, and they are not capable of acquiring or retaining their special athletic proficiency except at the expense of the better work they might do and ought to do" (R. A. Proctor, "Strength and Happiness," 1885, p. vi); a man does ill when he might do better. "We should play to live, not live to play"; it is our higher faculties, not our lower ones, which most require to be stimulated; he who follows recreation too much instead of his business, sooner or later shall have no business to follow; the best kind of recreation is judicious change of occupation. "The effect of League matches and cup ties is thoroughly evil. Men go in thousands, not to study or admire skill or endurance, but to see their team gain two points or pass into the next round. . . . The passions are excited to the highest pitch of human feeling. . . . The excitement during the match is epidemic, and twenty thousand persons, torn by emotions of rage and pleasure, roaring condemnation and applause, make an alarming spectacle. Every Saturday in winter more than a million people are cheering and

hooting round the football grounds. The tendency of all is towards brutality." . . . "The unutterable corruption of amateur athletics need not be dwelt upon; the betting and swindling, the feigned names, the selling of races, pace-making, that hateful travesty of sport, and many other abuses, is notorious" (E. Ensor, *The Contemporary Review*, 1898). "Bishop Mitchinson, the Master of Pembroke College, in an address at Cheltenham College on the occasion of the annual speech day, said he was shocked at the absolute devotion to athletics at his own college, where the prospect of getting their own men into the university eight was considered a far higher distinction than getting double first. That was distinctly wrong. When a nation placed physical enjoyment before culture of the mind it had started on the down grade. The besetting sin of Oxford to-day was absolute idleness. Men were not sorry about being ploughed, but rather seemed to enjoy it. There was a screw loose somewhere when the rank and file at the university gave themselves up wholly to play" (*London Daily Mail*, July 1, 1899, p. 3).

"Adversity has slain its thousands, and prosperity its tens of thousands." Ever since this country has become so wealthy, many of the rich persons in it have sought to become more happy by the imperfect method of filling their houses with luxurious and beautiful objects of taste and fashion, giving costly entertainments, spending their time in expensive amusements, in shooting, and in luxurious travel; instead of treating these as secondary means of happiness, and of furnishing their minds with knowledge of great truths which secure the greater happiness that no wealth can purchase; many successful business men do not really become more happy, but less so.

As the crest of a wave is always succeeded by a depression, so an era in which wealth is too easily obtained is followed by one of relative failure. Success breeds conceit and is more difficult to bear than failure, because it frequently produces idleness, whilst failure often causes increased industry and effort, and we know that the great majority of men are much more inclined to personal ease and enjoyment than to industry and usefulness. The decay of a nation is like a disease, when once it has begun, it must run its course, and governments can do but little to prevent it, because the momentum of the action is so great. In the infinity of time, however, even the rise, decline, and fall of a nation, is a comparatively ephemeral phenomenon; the process is also a slow one, and as the decline of Spain did not kill all the Spaniards, so a decline of England would not entirely ruin all the English.

Notwithstanding that each director and teacher of mankind may be reasonably expected to be acquainted with the fundamental elements of his own special subject, it usually falls to the lot of philosophers, rather than to that of politicians or theologians, to study and expound the fundamental bases of human actions, and to take the most comprehensive views of natural phenomena; both the latter classes of persons are more largely governed by the public who provide them with position and

power, and who expect them to satisfy their expectations as a return for their votes, influence, or money. The politician is expected to be a "practical man," *i.e.*, one who is able to distinguish between the theoretically desirable and the immediately attainable or expedient, and to disregard more comprehensive truths which the voters cannot understand; and the theologian is expected by his supporters to preach current sectarian doctrines whether they are true or false. Politicians and theologians are usually too little acquainted with the great energies of Nature which govern the rise and fall of nations, to be able to study those influences in relation to the government of mankind, simply because they have not been suitably educated and trained.

Comprehensively considered, the chief cause of decay in nations, families, and individuals, is the sacrifice of greater interests to smaller ones; and as all nations are stronger than one nation, and many men are usually stronger than one man, a single nation or individual is usually sooner or later overcome, and its influence decays. If, however, even a single man has powerful and pertinent truths on his side, and this is publicly known, his influence is greatly increased; Luther was to some extent an example of this. When a family largely sacrifices public welfare for their own advantage, the public sooner or later avenge themselves; the numerous aristocratic families in ancient Rome are considered to have decayed in this manner. When a nation neglects the rights of other nations in order to serve only its own purposes, war usually occurs; or when it is not sufficiently far-sighted or patriotic to prefer duty to pleasure, its decay is certainly promoted. It is important therefore to consider great questions in comprehensive aspects, and this can only be done by the aid of fundamental, scientific knowledge.

The chief ambition and leading idea of a nation varies with the national age, epoch, and history; in the most civilised nations at the present time, notwithstanding that knowledge is essentially of far greater importance and much more indispensable than money, the paramount idea is wealth. The degree of faith of most persons of this country in money is so great, that very few believe in the more essential importance of knowledge; and the impetus or momentum of this mass of belief, accelerated by its accompanying love of pleasure, is so enormous that the belief appears likely to continue until more scientific nations have surpassed us in knowledge, and we have experienced the painful effects of our mistake. Nations and communities, like individuals, are liable to repent too late, and neglect to apply remedies until decay stares them in the face. When monasteries and nunneries became wealthy they also became luxurious and corrupt, and in many instances had to be suppressed on account of their excesses and licentiousness.

About 170 years ago, Alexander Pope wrote the following truthful, remarkable, prophetic, and important statements:

> "Truths would you teach, or save a sinking land?
> All fear, none aid you, and few understand."

They were, however, much in advance of the time, and, like "the words of one crying in the desert," few understood, and therefore not many believed them; and even now, after so long a period of time, only a comparatively few appear to fully recognise their importance; and nearly all men, as they ever did, seek personal success by "swimming with the stream," rather than risk it by promulgating unpopular truths of great value to their country. Since Pope's time, however, civilisation has advanced, and important scientific truths, especially new ones, are now the coming power. The period is now at hand, and in the most civilised nations has actually commenced, when wealth will not be able to compete with superior knowledge; when not only present scientific knowledge must be systematically and extensively diffused, but new knowledge must be systematically and largely discovered and disseminated. The ordinary Englishman places too much confidence in imperfectly directed energy, vulgarly called "British pluck," and too little upon the fundamental knowledge which should direct it; the competition of Germany and America will perhaps convince him of his mistake. Competition weeds out incompetent individuals, firms, and nations; and the time appears to be gradually coming when all the great nations of the earth, except those in unsuitable climates, will produce for themselves nearly all the articles which we now make for them.

It is manifest from a consideration of a number of circumstances of an essentially fundamental character, that this nation is gradually becoming relatively less industrious, and more devoted to amusement and pleasure; it is increasingly more dependent upon foreign nations for food and other articles which are produced by industry, and is paying for those articles more largely in the form of coal, which is not much an industrial product, and in money. Just as in the phenomena of inanimate things, so also in social ones; it is not usually the most violent and sudden movements, such as a great war or revolution, that cause the decay of a nation, but the small, incessant, long-continued, and most universal ones, such as deficiency of industry, of truthfulness, or of honesty, which has that effect. "There is no real wealth except what springs from industry" (Adam Smith), either of body or brain.

It is well-known to scientific men that coal contains a sufficient amount of stored-up energy to lift its own weight about twenty-three hundred miles. Consequently to draw upon a large store of it in the earth is very much like drawing money out of a bank, and constitutes an easy method of obtaining money, without undergoing commensurate labour and sacrifice, and therefore without acquiring the valuable discipline which such labour and sacrifice impart. This condition, and others favourable to the easy acquisition of wealth, existed in this country about fifty or eighty years ago; this nation was then on the crest of a wave of remarkable pecuniary prosperity, caused by its being the first to apply a great store of coal to manufacturing and industrial purposes, chiefly through the medium of the steam-engine, machinery, and chemical processes, especially in the manu-

facture of cotton goods, iron, alkali, and acids. An immense amount of money was thus obtained without sufficient self-sacrifice, and we may safely infer from the well-known scientific principle of equality of action and reaction, that such a wave of prosperity must sooner or later be followed by one of relative retardation similar in magnitude, diminished however by the amount of our advance due to the discovery and application of new knowledge. Unlike the men who developed those great industries, who went to work early and continued late in their occupations, those who have succeeded them go to work late and leave early. Contemporaneously with the relative decline of industry and business ability of English employers, has arisen the discovery and application of coal and the use of water-power in foreign countries, and an increase of ability and of competition of foreign nations. Further, the working man, perceiving the amount of wealth, the luxuries, and short hours of labour of his masters, has become dissatisfied, and is continually demanding higher wages, and fewer hours of labour, largely regardless of the rights of the public; at the present time he is on the crest of a wave of prosperity, and is following the example of his master in seeking an excess of amusement. Instead of obeying the first rule of morality; to do all the good he can in his own particular sphere, to all men, himself included, by employing all his skill, and doing the maximum of work consistent with health, in the minimum of time, the English trade-unionist is trying to do the minimum of labour in the maximum of time, by working the "trade-union stroke," and is fast becoming ridiculous by his demands for fewer hours of labour, with a slower rate of work; and by thus gradually raising the cost of his productions both to himself and to others, he is approaching the point at which he will have less work to do. The anarchist, also, excited by envy, is resorting to violence and incendiarism in order to enforce his demands. "It must not be forgotten that such of the rich that are selfish, wasteful, and tyrannical are the parents of the nihilist and communist. The wealthy man or woman of pleasure, living like a fungus on the labours of others, without duties to his kind, is just as much a criminal and an enemy to society as the nihilist" (*The Open Court*, No. 25, p. 721). "Factories are starved to feed luxurious homes." "That which is everyone's duty," viz., to do the greatest good in his own sphere, "is no one's duty"; nearly every man lives too much for himself alone. Comparatively few men have the desire and ability to do good to others, and but few will sacrifice their pleasures in order to work unless they are compelled. Long-continued habits of the body and mind are as unalterable as firmly-fixed ideas; this explains the great resistance made by workmen to reduction of wages and to increase of hours of labour; by religious persons to change of belief; by young men to diminution of amusement and of sensual indulgences, and by many elderly men to contract their pleasures of eating and drinking. Politicians only make matters worse, because they have similar defects, they are largely seekers of power, and can only obtain it by yielding too freely to the ignorant masses. It is

probably best that the process should work out its own cure in the natural way; why should this nation not be punished for neglecting the first rule of morality, viz., to do the greatest good to all men? The pursuit of wealth first aids advance by developing industry and all the other elements of national progress; and, subsequently, when obtained in excess, it produces idleness, excessive devotion to amusements, and then decay. "History unrolls a long catalogue of nations that have been emasculated or corrupted by increasing riches" (Lecky, "Rationalism in Europe," 1890, vol. ii, p. 287). The beginning of decay is indicated by the flourishing of art; "it too often happens that the decay of a state dates exactly from the period when the arts of life attained their maximum" (Laycock, "Mind and Brain," 1869, vol. i, p. 31). "At the moment when, in any kingdom, you point to the triumphs of its greatest artists, you point also to the determined hour of the kingdom's decline" (J. Ruskin, "The Two Paths," etc., p. 128).

The teachers in the schools of this country experience a continually increasing difficulty in making the boys learn, and, at a general conference of head-masters of English schools, a resolution was passed deploring the fact, and attributing it to the excessive interest taken in amusements, especially in footballing. That the chief evil effects of this will appear in the future, when the boys have grown to be men, does not admit of doubt. The present generation of young men in England appear less likely to succeed in business than their parents:—(1) because, having devoted more of their time to amusements, they will have less industry, wisdom, and administrative ability; (2) they will meet more intelligent and scientific rivals to compete with; and (3) they will be confronted with a new class of difficulties introduced by the extension of new scientific knowledge. It is unreasonable to expect men who over-estimate small things to be able to successfully manage large ones, or to adequately value great truths.

Appreciation of new knowledge will before long determine success or failure in life, when trades and manufactures become more scientific; new scientific knowledge is rapidly becoming a source of great power, and, provided such power is properly used, it cannot be a cause of decay. The following is a quotation from a leader in *The Times* on this subject:—"The Germans have found that nothing pays so well as knowledge, and that new knowledge always pays in the long run. They act upon this principle by maintaining a steady demand for men competent to extend the domain of theoretical knowledge, paying them well for doing it, and taking their chance of one valuable discovery turning up among a score that for the present lead to nothing. How good that chance is may be judged from the enormous success attending German chemical industries of all kinds. Germany controls the fine chemical markets of the world, and that means that she takes tax and toll of almost every industry in every country. How easy we might have forestalled her can be fully understood only by those who know what a splendid start we had in capital, in machinery, in control of markets, and in root ideas. Some of her most lucrative in-

dustries have been developed out of English discoveries, due to the genius of individual Englishmen, but never properly grasped and worked out by English manufacturers. Her commercial domain will go on extending, and ours proportionately shrinking, unless Englishmen become practical enough to look beyond their noses, and wise enough to believe in knowledge" (*The Times*, August 25, 1896. *Nature*, vol. liv, August 27, 1896, p. 385).

As an instance of the neglect of new scientific knowledge by English manufacturers, we may mention the great aniline dye industry which was originated in this country. The basis of the aniline dyes, benzol, was discovered by Faraday in the year 1824, the dyes themselves by Hofmann, Perkin, and others, and the manufacturing process was largely evolved by Simpson, Maule, and Nicolson; but the German Government took Hofmann from us, gave him the appointment of Principal of the Berlin Laboratory, where he continued his researches on those dyes, and enlarged the foundation of their manufacture. What says he respecting Faraday's discovery of benzol?—"The old axiom cannot be too often repeated, that the search after the true, for its own sake, leads on to the discovery of its natural corollaries, the useful and the beautiful. For those, indeed, lie folded up in truth to be in due time evolved therefrom, even as the great tree unfolds itself from out the little seed." The example of the aniline dyes manufacture is only one out of others in which, through our ignorance of the great commercial value of new scientific knowledge, the latter has been neglected in order to obtain immediate maximum incomes and maintain families in affluence and pleasure. German manufacturers have largely solved the important problem how to make original scientific research commercially profitable, which English manufacturers with an almost isolated exception have failed to do, chiefly in consequence of their deficiency of fundamental scientific education and training (see *Nature*, October 28, 1897, p. 628). "To-day Germany easily leads all the world in the amount and value of her contributions to human knowledge, and the energy with which her students pursue the study of Nature" (Professor Cleveland Abbe, *Nature*, January 12, 1899, p. 261).

In the comparison of our industrial and commercial progress with that of Germany, it is sometimes assumed that an increased exportation of coal from this country is a sign of greater progress on our part; according to scientific views, however, such an increase is not altogether a sign of national advance, but partly one of profligacy and decline: (1) because it is largely a process of living upon our capital instead of upon our industry; drawing freely upon a reserve fund which we cannot replenish, much like taking gold continually out of a bank, and putting very little in; (2) because the amount of energy expended in the actual getting and raising of coal is small, whilst that obtained from it is large; the great difference of valuable energy between the two being obtained at very little cost; (3) because it is practically a method of obtaining much money by the nation without a proportionate amount of industry and individual improvement; and

(4) because, like all too easily obtained advantages, the process has a demoralising effect upon the national character. Coal is a substance of great intrinsic value, because it contains so much stored-up energy which may be readily employed to do a very large amount and variety of useful work. Unlike a highly manufactured article which requires much skilled industry and thought to produce it, or which gives extensive employment to intelligent workmen, and which trains and educates the nation in producing it, coal is obtained nearly wholly by means of the most uneducated and lowest class of labour, and the winning and raising of it largely debases instead of personally improves the workers; it is notorious that many miners are extremely ignorant and reckless persons. In these ways the pitmen are deteriorated by the work, and the land-owners, the mine-owners, and their families are demoralised by the too easily obtained money. In this process this nation, like the Spaniards in Mexico and Peru, has had the pleasure of largely enriching itself at very little cost, and in accordance with the scientific principles of causation, and equality of action and reaction, it must sooner or later, like the Spaniards, suffer the punishment of the evil effects. A similar reaction probably occurs in nearly all cases where wealth is too easily obtained and there are no sufficiently strong counteracting influences.

As a matter of course, this relative falling behind in the race of human progress will be denied by many persons; but "could we see ourselves as others see us, it would from many an error free us, and stupid notion." The idea of our loss of relative ability has been gaining strength gradually during several years:—"Yesterday the *Times* spoke out with no uncertain sound in connection with the often-repeated cases, in which, in various foreign markets, English are being replaced by German goods. 'Although nothing can excuse the short-sighted folly of our manufacturing classes in not providing for scientific research in the various branches of industry, yet it is the duty of a wise Government to take measures to counteract the folly of classes when it threatens the general interests. In one word, Great Britain stands at this moment in imminent danger of being beaten out of the most lucrative fields of commerce, simply because it does not recognise, while other nations do, the value of scientific organisation in the field, in the workshop, in the laboratory, and in the conduct of national policy'" (*Nature*, November 28, 1895, p. 73). "As we are accustomed in this country to look on the *Times* as a political barometer, the appearance in it of the very admirable article, to which we drew attention last week, must be regarded as a proof that the exigency of the situation in which the nation is placed is likely soon to attract some share of the attention it imperatively demands" (*ibid.*, December 5, 1895, p. 97). We originated the manufactures of coal-tar dyes; Germany, however, possesses now the great manufacture of dye stuffs, the exports of which are valued "at nearly £14,000,000 for the year 1895" (*The Times*, January 7, 1896, p. 13). "The industrial supremacy of Great Britain has long been an axiomatic common-place; but it is fast turning into a myth, as inappropriate to fact

as the Chinese Emperor's computation of his own status. This is a strong statement, but it is neither wide nor short of the truth. The industrial glory of England is departing, and England does not know it" (E. E. Williams, "Made in England," 1896, p. 1). In accordance with the great principle of evolution, individuals and nations have to change their habits and occupations, whether they are willing or not; men have to cease making articles for which there is no more demand; thus, makers of snuffers and tinder-boxes are no longer required; similarly, this nation may be compelled to diminish its manufacturing activity, expatriate its workmen, and become more a community of financiers, or whatever the powers of Nature compel it to be. Those who resist necessary change either decay or die. Manufacturing processes, and the workmen employed in them, may have to emigrate to those countries where the energy of coal and of waterfalls is cheapest and most applied.

As a set-off to the foregoing statements, I may quote the following remarks from an address by Sir H. H. Johnston:—"All the great rivers and lakes of Africa have been made known to the world mainly by the explorations of British subjects. Englishmen, Irishmen, Scotchmen, or Welshmen first discovered and made an actual fact the existence and approximate dimensions of most of the African lakes. The name of Livingstone is indissolubly connected with the mapping of the Zambesi from its source to its mouth. Other Englishmen first explored and mapped most of the African rivers. Mungo Park is acknowledged by all men to have been the first to place the Niger river accurately on the map. Stanley is the hero of the Congo. As regards the Nile and its system, what geographical work done by other Europeans can be compared with the researches of Bruce, Petherick, Baker, Speke, and Grant? Who were the first to turn the alfa grass of North Africa to the practical use of making paper?—Englishmen. Who first created palm oil as a trade product, now being annually sold for millions of pounds?—Englishmen. It was Englishmen like Sir John Kirk, Sir Alfred Moloney, and others, who started or developed the trade in rubber and gums on the east and west coasts of Africa. Englishmen, first of all, have developed the cultivation of cotton in the Zambesi countries and in Egypt, and indigo on the Niger. Who first discovered diamonds and gold?—Englishmen; and the nitrates, which it is hoped may yet add to the exports of Egypt?—an Englishman, Mr. Floyer. Who first stimulated the cultivation of the ground-nut in the Gambia, which now produces nearly all our finest olive oil, quietly manufactured at Marseilles?—Englishmen. Who introduced the tea-plant into Natal, and created what is most likely to be a most flourishing trade in that gallant little colony?—Englishmen. And last on this list of agricultural products, who were the first coffee-planters in Central Africa?—a dogged little band of Scotchmen. Who constructed the first railways in Africa, which brought prosperity to Egypt and turned Cape Colony from a little red patch on the southern extremity of Africa into a vast empire? Who encircled the whole continent with telegraph cables, and conceived

the carrying out of the bold project of traversing Africa from south to north by telegraph wires? Who put the first steamers on the Niger, on the Zambesi, on the Congo, on the Nile, on the Gambia, on almost every navigable African river?—Englishmen" (*Review of Reviews*, January, 1897, p. 5). A multitude of other instances might be quoted of great discoveries, inventions, commercial enterprises, founding of colonies, etc., due to Englishmen, but these were nearly all accomplished before England became so wealthy; and it remains to be seen whether the energies of Nature will so operate as to compel this nation to preserve its prestige by valuing money and knowledge more in accordance with their relative essential worth.

We should, however, remember that the intrinsic and extrinsic values of things are often very different, that whilst the relative essential importance of knowledge is a fixed amount, the degree of its extrinsic value to mankind varies with the degree of civilisation, that portion of knowledge which was in advance of our necessities a century ago is now indispensable to national welfare; and we may be certain that if we have really over-estimated the value of wealth and under-estimated that of knowledge in our particular age and circumstances, we shall receive the natural punishment —

> "Ill fares the land, to hastening ills a prey,
> Where wealth accumulates and men decay."
>
> —*Cowper.*

The decline and fall of noble families and of great manufacturing and commercial firms, are both brought about by the operation of the same influences in a somewhat similar way, *i.e.*, by the sacrifice of duty to pleasure, and hence has arisen the saying respecting ironmasters, "from clogs to clogs in three generations," and this reminds us of others, "After one who works, comes one who wastes and wants," "The third generation of quakers goes to church," etc. The way in which the rise and fall of a business firm occurs is usually very simple. Take the case of an ironmaster, for example; a common puddler, an industrious and careful man, who works steadily at his calling, saves a little money, sets up as a small master, makes his son work industriously with him, gradually becomes wealthy, and dies; his son, being a disciplined man, carries on the greatly increased business successfully, and largely extends it, but his son, instead of being brought up to industrious and careful habits, is sent to Oxford, often not so much to acquire knowledge or comprehensive, intellectual discipline as to make acquaintance with sons of the aristocracy and so to obtain an entrance into aristocratic society, and thus add social position to the family wealth; a frequent result of this is, he acquires wasteful and idle habits, so that when it subsequently falls to his lot to manage his father's business, he is incompetent, the business declines and the influence of the family with it. Firms often decay in consequence of their pro-

prietors devoting themselves too much to other pursuits, such as politics, travel, commercial speculations, stock-exchange gambling, financing, horse-racing, amusements, etc. The rise and fall in such cases usually occurs in about three generations. Of course there are other causes of decline besides these. The men who inherit businesses or fortunes are not usually equal in ability to those who produced them.

If you make your children your equals they will soon become your masters; indiscreet giving of pleasure to children by wealthy parents in order to gratify themselves often returns to them sooner or later as pain in some form or another. Children who are helped by their parents in everything cannot acquire much ability, the sons of fond parents therefore rarely make very able men. "A duck of a child often becomes a goose of a man." "Everybody had seen it, but the father had not, that his son brought up in liberty had become a scamp, a foolish, rude lout, a boisterous scapegrace. The father had enjoyed the pranks of the frolicking child; but he was disappointed when the adult son repeated the same pranks in business, not to mention other dissipations and follies."—"Who is that man? His name is legion. Look around and you will recognise him at every turn among your acquaintances and your business friends. This man can almost be considered as the typical Liberal. It is not always his immediate son who thus shows the folly of his errors; in many cases it is the grandson or the child of the grandson. For the virtues of the parents remain a blessing to the second and third generation. The capital of moral strength is not suddenly exhausted, yet it dwindles away rapidly."—"The children of men of this stamp sometimes will remain in possession of their father's wealth. If not laborious and industrious, yet they are shrewd business men, sometimes unscrupulous too; but they have mentally and morally degenerated, and in the place of the republican simplicity of their grandsire, they assume aristocratic habits. They are ashamed of the honesty, the industry, and frugality of their ancestors, and make themselves ridiculous as servile imitators of European nobility."—"The man to whom liberty was dearer than life neglected his soul and he neglected to build up the souls of his children. Thus they degenerated and involved their old father in their own ruin" (*The Open Court*, No. 123, pp. 2015-2016).

Usually "a man cannot serve God and mammon" without being punished. Many pious tradesmen selfishly try to obtain too much, they try "to make the best of both worlds." "There is no more efficient cause of mental degeneracy, perhaps, than the mean and vulgar life of a tradesman whose soul is set entirely on petty gains; who, under the sanction of the customs of his trade, practises systematic fraud and theft; and who thinks to outweigh the iniquities of the week by the sanctimonious observance of the Sabbath. Such a one is not likely to beget children of sound moral constitution, and for him to hope to found a family which shall last is little better than to hope to build on quicksand a house which shall stand. The determination of nature which he has acquired will be

transmitted as an evil heritage to his children, and show itself in some form of moral or intellectual deficiency" (Maudsley, "Pathology of Mind," 1879, pp. 134, 135). "He that maketh haste to be rich shall not be innocent" (Proverbs, chap. xxviii).

If either a man or a family persistently neglect the laws which govern physical or mental health, he or they are compelled to suffer premature decay or death. The notorious Jukes family is a striking instance of this. The first member of this family was a trapper of animals—a man of roving habits; and it is recorded that through neglect of intellectual and moral training "his descendants in the course of 150 years furnished the State of New York with no less than 830 criminals of baser types, besides many imbeciles, lunatics, and other undesirable characters, and that of all the members, numbering about 1,200, not twenty of the men were skilled workmen, and ten of these learned their trade in prisons." "They cost £260,000 in prison expenses and public relief," and the family ultimately died out (*Scientific American*, vol. xxxix, p. 241, October 19, 1878; "The Criminal," by H. Ellis, p. 100; "Aspects of the Social Problem," B. Bosanquet, p. 303). At the present time, if it was not for the labours of scientific men in discovering knowledge, and that of teachers, lecturers, public speakers, ministers of religion, etc., in diffusing it, and thereby helping to maintain the present degree of civilisation, the whole of civilised mankind would probably relapse into barbarism.

All kinds of religion degenerate when they are adapted to suit ignorant minds. Theological sects and systems, like individual men and nations, cannot live for ever, but rise, decline, and fall in consequence of the operation of the forces of Nature in accordance with the laws of causation, evolution, and progress. The Roman Catholic Inquisition, with all its fearful cruelties, gradually declined from the year 1498 and ceased in 1808. The Christian religion has greatly changed, is still changing, and will largely alter. If a nation unduly sacrifices the pursuit of knowledge to ecclesiastical observances and unprovable beliefs, it does not advance in civilisation with other nations; conspicuous examples of this are seen in the miserable condition of Spain, Portugal, Mexico, and Ireland. According to statistics, the proportion of illiterate persons in the latter country is much greater than in England or in Scotland. Nations who do not adopt new ideas and assimilate new knowledge when the period is ripe for them, do not either mentally, morally, or physically advance, but change only so far as their immediate surroundings change; the Chinese are a conspicuous instance of this, and a further effect is shown by their recent great defeats by the Japanese, attended by loss of territory; the recent defeat of the Spaniards by the Americans is another example. Even languages decay and become extinct; those of the stone age have quite disappeared. Deficiency of fundamental secular knowledge is quite sufficient to cause the decay, sooner or later, of any sect or nation.

History informs us that false and unprovable ideas, sooner or later, become effete, and are replaced by others more consistent with truth and

evidence, the theological doctrine of the earth being a plane and the centre of the universe has been expelled by science; paganism has largely died out; "the heterodoxy of one age is the orthodoxy of the next" (Rev. H. Haweis, "The Dead Pulpit," 1896, p. 31); "the dry rot is in our University pulpits" (*ibid.*, p. 21), and many of our present theological ideas are decaying. The Roman Republic was largely founded on bodily slavery, and slavery was one of the chief causes of its downfall; similarly, Roman Catholicism, and, in various degrees, other forms of sectarianism, is largely based upon mental slavery, and will probably, sooner or later, have to give way to the progress of scientific knowledge. A scientific Luther is needed to purify the Christian faith of its irrational dogmas. Religion is always a growth (Max Müller, "Natural Religion," 1892, p. 553); and, so far as it is inconsistent with the age or the evidence, will it sooner or later decay.

A nation is but a collection of individuals, and the basis of success of a nation is essentially the same as that of each individual composing it. Provided a man has a sufficient income, obtains all his powers and possessions properly, and uses them well, his success is so far secure, and the sources of his possessions and the uses he makes of them are secondary matters. He may obtain his income, etc., either by means of his own bodily and mental labour, or by employment of workmen and others; he may obtain it by lending his money, etc., or he may change his occupation from worker to lender, or the reverse; and his choice is a secondary matter; and it is precisely the same with a nation. An intelligent mode of living is by saving money, investing it, living entirely upon the interest from it, and doing the greatest good with it. It does not necessarily follow that because the exports of this nation are continually diminishing, and its ordinary imports increasing, that the nation is in a state of decay, living upon its capital; it may be only gradually changing its occupation from that of a bodily worker to an intellectual one, from a maker and producer of articles to an investor in foreign securities; and that it is living in an increasing degree upon interest from foreign loans. The most important question is, are we, as a nation, doing the greatest good? We are fast becoming the landlords and money-lenders of the earth; it has been estimated that we have invested between 4,000 and 5,000 millions of pounds in foreign property and securities, and that our amount of "unearned increment" from this approaches £200,000,000 per annum (see *Review of Reviews*, July, 1899, pp. 53, 54); such a mode of living upon dividends, however, tends to produce luxury, idleness, and national decay.

Nations as well as individuals decline in opposition to their will and wishes. "After the acquisition of the New World, when immense riches, found in Mexico, Peru, and other parts of America, fell under Spanish domination," "pride and love of ease prevented exertion. The wealth of the Indies, poured into Spain, passed rapidly into other countries, where energy, and commercial and manufacturing industry, were fostered. "The Spanish population," "received money which was quickly expended, and

continued nearly as poor as ever, whilst other nations, who supplied their wants and administered to their luxuries, gradually absorbed the wealth wrung from the sinews of the wretched Indians, who toiled for Spain in search of precious metals in the mines of America." "Thus did a nation, inferior to none in Europe in advantages of soil and climate, possessed of the richest colonies in the known world, and of most ample means for creating wealth, independence, and information, gradually sink into poverty, fanaticism, and ignorance, as well as political insignificance. From the era of the conquest of Mexico and Peru, Spain has continued to decline; she has declined in population, industry, and vigour. From being the first kingdom in Europe, she has become one of the least considerable. Portugal has experienced a like fall since the settlement of Brazil, and from the same cause" (W. A. Mackinnon, "History of Civilisation," 1849, vol ii, pp. 84, 86, 92). In Spain "the average term of life is eleven years less than in England" (Mulhall, "Progress of the World," 1880, p. 422); "and mendicancy is an institution of the country" (*ibid.*, p. 424). "Nothing remains of the £980 millions of gold and silver that Spain drew from the New World in the 17th and 18th centuries." "Ill got, ill gone." "Spain is to-day much poorer than before the days of Pizarro" (*ibid.*, p. 437). The proportion of criminals in Spain is also large.

"The Portuguese as a nation sank in their energy, and retrograded in civilisation, from the time when ignorance superseded information, superstition supplanted religion, and idleness took the place of industry." "The examples of Spain in the American continent, of Portugal in Brazil and the Indies, forcibly confirm the truth, that unless the elements of civilisation and industry are spread through a people, the mere means of acquiring gold and silver are not sufficient to ensure national prosperity." "The Portuguese held extensive possessions on the coast of Guinea, in Arabia, Persia, the Brazils, and both peninsulas of India." "Whatever wealth came into Portugal from any of these countries was transferred to more industrious nations, and the result was, that the wealth so procured, instead of promoting civilisation, seemed to have rendered the people more idle, corrupt, and prone to bigotry." "Spain and Portugal continued to receive annually immense sums, the demand for European goods was excessive; but as the decline of their manufactures obliged them to depend upon foreigners for the supply, their wealth became the common property of Europe; and the conquerors of the New World dwindled into the factors of England and Holland" (W. A. Mackinnon, "History of Civilisation," 1849, vol. ii, pp. 97, 99, 100). "Even commercial activity and wealth, without moral principle, will not long hold a community together" (*ibid.*, p. 112). "In the 18th century, Portugal received from her colony of Brazil more than £150 millions in precious metals, to-day she is one of the poorest countries in Europe" (Mulhall, "Progress of the World," 1880, pp. 453-454). "The Shah's empire is dwindling away as fast as the Sultan's" (*ibid.*, p. 470). Failure, "like an avenging angel," follows at a

distance in the wake of idleness, ignorance, and improperly-used success. History tells us that wealth, and luxury, *i.e.*, the bad use of money, ruined the ancient powers of Nineveh, Babylon, Egypt, Persia, and Macedonia. The wealth, instead of being devoted to doing the greatest good, and developing men's higher faculties, was employed in stimulating their lower ones. When nations become immoral they decline; what is the present state of Greece? it is the home of brigands, and a place unsafe for travellers. "The fall of the empire of the Cæsars was the consequence of the vices and pollutions that originated and existed individually and collectively in the community" (W. A. Mackinnon, "History of Civilisation," 1849, vol. i, p. 74). "The wealth which poured into Rome when the Pontiff had more influence than he has now, produced the same negative effect on the population as the wealth of the Indies, when poured into Spain, had upon the Spaniards. The industry of neither community was increased, the people remained idle and quiescent; the requisites for civilisation lay dormant, and bigotry superseded moral principle (*ibid.*, vol. ii, p. 124). The corruption, decay, and fall of Rome, "may in the beginning be attributed to an influx of wealth" (Lord J. Russell, "English Constitution," p. 460). The Emperor Augustus "boasted that he found Rome in brick, and left it in marble" (A. Alison, "History of Civilisation," 1860, p. 150):

"Where is Rome?
She lives but in the tale of other times;
Her proud pavilions are the hermit's home;
And her long colonnades, her public walks,
Now faintly echo to the pilgrim's feet
Who comes to muse, to solitude, and trace,
Through the rank moss revealed, her honoured dust.
But not to Rome alone has fate confined
The doom of ruin; cities numberless,
Tyre, Sidon, Carthage, Babylon, and Troy,
And rich Phœnicia—they are blotted out,
Half-razed from memory, and their very name
And being in dispute."

—*Kirke White.*

All these quotations illustrate the well-known proverb, that "where wealth accumulates, men decay," and that wealth when too easily obtained tends to produce that effect by diminishing the incentives to self-discipline and industry, and increasing those of self-gratification. Whilst it requires men of expediency to govern a nation, it needs philosophers with more comprehensive views to reliably predict the national future. Each civilisation, like each living thing, contains within itself the seed of its own decay; thus poverty produces industry, and industry produces wealth, wealth produces luxuriousness, idleness, and pleasure, and these, by taking the place of industry, new knowledge, and self-improvement, cause decay. "Knowledge is the salvation of any State, and without constant progress

in knowledge, and reforms in conformity with it, no State can be permanently maintained" (A. Alison, "History of Civilisation," 1860, p. 241). It is "want of reform, especially in matters relating to morals and religion which causes decline of civilisation" (*ibid.*, p. 242). It is worthy of consideration, whether in this country, as in Rome, excess of amusement may not become a public danger; the cry of the lower classes here for more money and amusements is not very unlike that of the masses in Rome and in Spain for "bread and the circus." Probably the most powerful counteracting influence to the decay of this nation lies in the semi-hardy climate of this country which excites and stimulates its inhabitants to activity. As long as an individual, a community, or nation, uses its possessions well, however much it may change, it can hardly decay.

Additional information respecting national decline may be found in Playfair's work on "The Rise, Decline, and Fall of Great Nations"; Buckle's "History of Civilisation in England"; Guizot's "History of Civilisation"; Gibbon's "History of the Decline and Fall of the Roman Empire"; Burke's "Vicissitudes of Families," and other well-known books.

34. Universality of Wave-Motion.

Nearly all periodical changes in Nature have been likened to rhythmic action and wave-motion; thus there are the extremely minute waves of light and radiant heat, the larger ones of electro-magnetism, the still larger waves of sound, the rhythmic actions of the heart and lungs, the visible waves on the surface of water, the much larger waves called "the tides," the sinuous or wave-like motion of the planets in their orbits, the rise and fall of temperature in summer and winter, the alternate states of sleeping and waking, the rise and fall of individuals, firms, families, tribes, and nations, the pendulum-like changes of government from Conservative to Liberal, and the reverse, etc. "Civilisation is an ebb and flow" (Macaulay). Nature's poetry is vibration, wave-motion, rhythm, and harmony, and we all reverence, worship, and admire it; and human music and poetry are of a similar character.

"A careful study of our own functions will show that we do nothing without some relation to exact periods of action. We not only hunger and desire sleep, and wake at regular intervals, but the circulation and respiration, and all unconscious functions, obey established rhythmic times. Passing into society, we are discovered to be under such laws of periodicity that we have rhythmic social beats of pessimism and optimism. Financial expansion and contraction with crises which come about with regularity" (*The Open Court*, No. 165, p. 2582). "When matters are at their worst, they begin to mend," because the deepest depression of the wave of adversity has passed. Rhythmic action is universal, and, as far as we can infer, eternal. As there are "wheels within wheels," so are there waves superimposed upon each other; thus a man or a nation may be rising in wealth

whilst declining in morality; families are rising and falling in prosperity, largely independent of the state of the nation. As civilisation progresses, the amplitude of its waves appears to diminish, probably because the differences between nations grow less, their conflicts smaller, the contrast between ignorance and intelligence less. In an imaginary millennium, as in an ideal immortality, there would be no decline or decay, and therefore no rise or fall of condition; the possibility of perfectly uniform happiness, either in the form of a millennium or of immortality, is, however, a very unscientific assumption.

35. Causation is Stronger than "Justice."

The great forces of Nature are stronger and over-rule even that which we, with our narrow views, term "justice." We frequently see this in great natural calamities which man is largely unable to avoid or prevent, such as earthquakes, pestilence, floods, hurricanes, blizzards, arctic winters, avalanches, etc., in which human suffering and loss of life occur on a fearful scale of magnitude; millions of human beings having in some cases perished by a single famine or pestilence in India, or by a flood in China; and if by the action of natural powers the temperature of this earth was reduced to a comparatively few degrees below zero, all vegetation and the whole of mankind would perish. Why are those fearful calamities permitted? Why does each new generation of men require to be educated afresh instead of inheriting the whole of the knowledge, wisdom, and abilities of their parents? Why have all mankind been compelled to wade through countless ages of error, sin, and suffering in a gradual progress towards truth, purity, and happiness? and why are they even now extremely imperfect, instead of being created perfect and happy at once? It is evidently because we are governed by irresistible, inexorable, and unfeeling powers, the same as those which govern inanimate substances, and not by an omnipotent, omniscient, and benevolent being having like feelings to ourselves. The inference to be drawn from the whole of these truths is, that man must not only obey those forces, but must in many cases suffer, without apparently having done any avoidable wrong to deserve it, and without being able to avoid or prevent it; he must learn to be humble, and to perceive his extreme insignificance in Nature. In many cases of social relations also, either many men must be sacrificed to one man, or one man to many.

Much has been said by different writers respecting the extreme cruelty towards man and other animals of the operations of "God's laws" in Nature, and according to ordinary human ideas, there can be no doubt about the matter. "In sober truth, nearly all the things which men are hanged or imprisoned for doing to one another are Nature's everyday performances. Killing, the most criminal act recognised by human laws, Nature does once to everything that lives; and in a large proportion of

cases, after protracted tortures, such as only the greatest monsters we read of ever purposely inflicted on their fellow-living creatures." Not only is the surface of the earth, but the whole mass of the ocean, an enormous shambles, where animals are killing each other in millions daily. "Nature has noyades more fatal than those of Carrier; her explosions of fire-damp are as destructive as human artillery. Her plague and cholera far surpass the poison-cups of the Borgias. Even the love of 'order,' which is thought to be a following of the ways of Nature, is, in fact, a contradiction of them. All which people are accustomed to deprecate as 'disorder,' and its consequences, is precisely a counterpart of Nature's ways. Anarchy and the Reign of Terror are overmatched in injustice, ruin, and death by a hurricane and a pestilence" ("Three Essays on Religion," by J. S. Mill, p. 28; also *The Open Court*, No. 239, p. 3188). The Black Death appeared in Europe in 1348, and "during the three years that it prevailed, it is said to have carried off twenty-five millions of persons, London having lost over 100,000," and "in the East more than thirty-five million persons perished" (Beeton's "Dictionary of Science and Art," vol. i, p. 296). "It is estimated that at least thirteen millions of human beings have perished from earthquakes" (*ibid.*, p. 733). Some of our greatest sudden "evils," such as earthquakes, we are usually unable to predict, or to protect ourselves against them.

"To us, measuring things by human intelligence, the seemingly prodigal waste of material, the multitudes of germs and seeds that perish timelessly, the numerous abortive failures of function and development, the slow and bungling methods of work; a whole creation groaning and travailing through countless ages of pain and death in order at the end to issue in such a being as primeval man, then, after his coming, countless ages more of human savagery and infinite waste of life, marked by suffering so great that it might fairly be questioned whether all those that had gone before would fill up their measure" (Maudsley, "Body and Will," p. 182). "The facts of organic and human nature, when observed frankly and judged without bias, do not warrant the argument of a supreme and beneficent artificer working after methods of human intelligence, but perfect in all his works; rather would they warrant, if viewed from the human standpoint, the conception of an almighty malignant power that was working out some far-off end of its own, with the serenest disregard of the suffering, expenditure, and waste which were entailed in the process" (*ibid.*, pp. 180-181).

"Nature impales men, breaks them as if on the wheel, casts them to be devoured by wild beasts, burns them to death, crushes them with stones like the first Christian martyr, starves them with hunger, freezes them with cold, poisons them by the quick or slow venom of her exhalations, and has hundreds of other hideous deaths in reserve such as the ingenious cruelty of a Nabis or a Domitian never surpassed. All this Nature does with the most supercilious disregard both of mercy and of justice, emptying her shafts upon the best and noblest indifferently with the meanest and

the worst; upon those who are engaged in the highest and worthiest enterprises, and often as the direct consequence of the noblest acts, and it might almost be imagined as a punishment for them. She mows down those on whose existence hangs the well-being of a whole people, perhaps the prospects of the human race for generations to come, with as little compunction as those whose death is a relief to themselves, or a blessing to those under their noxious influence. Such are Nature's dealings with life. Next to taking life (equal to it according to a high authority) is taking the means by which we live; and Nature does this too on the largest scale and with the most callous indifference. A single hurricane destroys the hopes of a season; a flight of locusts or an inundation desolates a district. A trifling chemical change in an edible root starves a million of people. The waves of the sea like banditti seize and appropriate the wealth of the rich and the little all of the poor with the same accompaniments of stripping, wounding, and killing, as their human antitypes. Everything, in short, which the worst men commit either against life or property is perpetrated on a larger scale by natural agents" (J. S. Mill, "Three Essays on Religion," p. 28, and *The Open Court*, No. 239, p. 3188). The great disregard of human and animal life by the operation of the forces of Nature, as in the recent earthquakes of Ischia, Japan, and many others, ought to teach us that in cases where objects of greater importance and magnitude are involved, pain and death of countless numbers of men and animals is quite a secondary matter. These and other facts are quite sufficient to prove that the earth and all mankind upon it are governed by ruthless and irresistible laws rather than by what we with our very limited knowledge and capacities term "justice."

The following is a copy from a quotation given in the *Review of Reviews*, May, 1895, p. 423, respecting the Eruptions of Krakatoa in the Straits of Sunda, "described for the first time by an eye-witness, Mr. Jean Van Gestel, one of the persons sent off by the Dutch Government to take scientific observations" (see *The Cosmopolitan Magazine*, April, 1895, p. 719). "They saw an immense column of fire, and what appeared to be smoke, at a distance of fifty miles off. From time to time immense fragments of incandescent stone were hurled up from the crater three or four hundred feet into the air, when they burst with a loud explosion. When they were three-quarters of a mile from the shore, they discovered what they supposed to be a river was a torrent of melted sulphur. They landed on the island and endeavoured to climb towards the crater. At the distance of half-a-mile their skin roasted and cracked. For the first three hundred feet from the edge of the crater, the ascending column was one uniform white hot mass of clear flame of dazzling brightness. This column of flame was about one and a half miles in diameter. As he turned back to the ship, he saw the bottom of the footprints that he had made in coming, aglow with fire from beneath. The steamer then returned. This was in May, and the eruption continued night and day until the 12th of August.

"By that time everyone had got used to it and no one even talked about it any more. On August 12th, Mr. Van Gestel, looking out from his valley a mile up the mountain slope, behind the city of Anjer, thirty miles from Krakatoa, was much impressed by the beauty of the scene. The birds were singing and the fishermen's boats were lying in the bay at anchor. As he looked, he suddenly became aware that all the little boats were moving in one direction. In an instant, to his intense surprise, they all disappeared. He ran higher up the hill, where he commanded a better view, and looked out to sea.

"'Instantly a great glare of fire right in the midst of the water caught my eyes, and all the way across the bay and the strait, and in a straight line of flame to the very island of Krakatoa itself, the bottom of the sea seemed to have cracked open so that the subterranean fires were belching forth. On either side of this wall of flames, down into this subaqueous chasm, the waters of the strait were pouring with a tremendous hissing sound, which seemed at every moment as if the flames would be extinguished; but they were not. There were twin cataracts, and between these two cataracts rose a great crackling wall of fire hemmed in by clouds of steam of the same cottony appearance which I have spoken of before. It was in this abyss that the fishing boats were disappearing even as I looked, whirling down the hissing precipice, the roar of which was already calling out excited crowds in the city of Anjer at my feet.'

"Whilst he was looking, an immense and deafening explosion, louder than ever heard at Krakatoa, partially stunned him. It was a moment or two before he could realise the fact that the whole world had been plunged into darkness.

"'Darkness had instantly shrouded the world. Through this darkness, which was punctuated by distant cries and groans, the falling of heavy bodies, and the creaking disruption of masses of brick and timber, most of all the roaring and crashing of breakers on the sea, were audible. The city of Anjer with all its sixty thousand people in and about it, had been blotted out, and if any living being save myself remained, I did not find it out then. One of these deafening explosions followed another, as some new submerged area was suddenly heaved up by the volcanic fire below, and the sea admitted to the hollow depths where that fire had raged in vain for centuries.'

"The awful surge of the ocean as it rushed landward frightened him, and he ran up the mountain side. For hours and hours he fled up the road in darkness. At last he saw a house standing on the roadside. He rushed in, thinking to find relief from the intense heat, but through the tiles of the floor little blue flames were flickering, and the house itself seemed like a furnace. Under the floor he saw the body of a woman in native garments. At last, at four or five o'clock in the afternoon, he reached the city of Serang, where he was the first to bring the news. He was supposed to be a lunatic for two days. At last he was soothed by drugs into sleep, and soon afterwards recovered. When he returned he

found that every life and bit of vegetation had been consumed, and every living creature blasted and burned up. Six hundred miles away it was necessary to burn lamps all day. The city of Anjer lay 100 feet under water. Mr. Van Gestel says that he thinks it a very moderate estimate that two hundred thousand persons lost their lives in Java and Sumatra. The north-west coast of Java was covered six and seven feet deep with ashes."

Extract from a letter from the Superintendent of the Eastern Extension Telegraph Company at Batavia, September 9, 1883: "The distress amongst the population bordering the Java and Sumatra coasts, in the straits of Sunda, is indescribable. There are hundreds of persons now supposed to be dying of starvation, and who cannot be got at by sea on account of the accumulated masses of floating pumice stone. The number of people drowned, starved, and scorched to death will never be known, because no registry is kept by the natives. In places where entire villages have been washed away, the loss of life is estimated by multiplying the sum total of native houses by five, this being the average number of inmates to each house. They will be able to know what number have been burned, as two dollars are being paid to the natives for each body so disposed of; but how many have been driven out to sea and are now being devoured by the sharks in the straits and by crocodiles along the coast? Of these no vestige will remain. In a sanitary point of view it is, perhaps, good that this is happening, for the stench arising from the bodies that have remained behind, and are being burned, is said to be unbearable" (*The Electrician*, November 3, 1883, p. 595).

An officer on board the United States man-of-war *Enterprise* writes respecting the above disaster:—"About a week after we reached the Straits of Sunda we had a phenomenal sunset, awful in its grandeur, that terrified nearly all on board. Just before sundown the heavens became quite dark, and then suddenly changed to a dark green. After the sun had sunk behind the horizon it became light again and the green tint gradually died away, the colour of the sky after a short while regaining its normal condition. On that very day and hour those terrible eruptions took place on the island of Krakatoa, 700 miles away from us. Three days after these atmospheric phenomena we noticed that the water was covered with a floating scum, which upon examination proved to consist of scoriæ and pumice." He added the following graphic description:—"I have just seen the captain of an English ship that was near the island when the wrath of the storm and the earthquake fell upon it. He told me that the barometer, just before any disturbance was noticeable, began to fluctuate rapidly, dropping from 31 to 26 like a flash. He said that the atmospheric disturbances that soon followed, combined with the commotion of the waves, presented a picture that only hell as dreamed of by Milton could have equalled. Balls of fire crossed and recrossed the heavens and burst in mid-air, falling into the sea in innumerable fragments, accompanied by loud hissings. Heavy masses of clouds black as night rushed together

from different points of the compass, and whirling around and around seemed to be struggling for the mastery. Towering waves seemed to come from every point of the compass, and rushed together with terrific roars. Lightning leaped from the waves and was lost in the heavens. The wind, which was blowing cold, suddenly changed to a blast of heated air almost unbearable. The air was charged with electricity, and every man who took the wheel was instantly paralysed for the time being. Scoriæ began to fall as thick as snow. After the ship passed out of the storm the captain said that the scoriæ on the decks and rigging was so thick that it took fifty coolies three days to throw it into the sea" (*ibid.*, December 8, 1884, p. 76). There are nearly three hundred volcanoes on the earth (Keith Johnston).

On August 13, 1868, a great earthquake occurred in Peru. "At Arequipa, at half-past five o'clock, an earthquake shock was experienced; half-a-minute later a terrible noise was heard beneath the earth, a second shock more violent than the first was felt, and then began a swaying motion, gradually increasing in intensity. In the course of the first minute this motion had become so violent that the inhabitants ran in terror out of their houses into the streets and squares. In the next two minutes this movement had so increased that the more lightly built houses were cast to the ground, and the flying people could scarcely keep on their feet." "And now there followed a terrible scene. The swaying motion changed into fierce vertical upheaval. The subterranean roaring increased in the most terrifying manner; then were heard the heart-piercing shrieks of the wretched people, the bursting of walls, the crashing fall of houses and churches, while over all rolled thick clouds of a yellowish black dust, which, had they been poured forth many minutes longer, would have suffocated thousands." "The whole town was destroyed. Not one building remained uninjured, and there were few which did not lie in shapeless heaps of ruins" (Von Tschudi). "It is impossible to contemplate the effects which followed this great earthquake—the passage of a sea wave of enormous volume over fully one-third of the earth's surface, and the force with which, on the furthermost limits of its range, the wave rolled in upon shores more than 10,000 miles from its starting place—without feeling that those geologists are right who deny that the subterranean forces of the earth are diminishing in intensity" (R. A. Proctor, "Light Science for Leisure Hours," 1871, pp. 199, 212). "Hardly a day passes without an earthquake being felt somewhere in Greece, for no less than thirty-four are recorded as occurring during January alone" (*Nature*, May 7, 1896, p. 16).

"In the great hurricane of 1780, which commenced at Barbadoes, and swept across the whole breadth of the North Atlantic, fifty sail of ships were driven ashore at the Bermudas, two line-of-battle ships went down at sea, and upwards of twenty thousand persons lost their lives on the land." "In the great gale of October, 1864, all the ships in the harbour at Calcutta were swept from their anchorage, and driven one upon another in inextricable confusion." "A vast wave swept for miles over the surrounding country, and whole villages, with their inhabitants, were swept away.

Fifty thousand souls, it is believed, perished in this fearful hurricane" (R. A. Proctor, "Light Science for Leisure Hours," 1871, pp. 156, 157). According to a Reuter telegram as recent as June 24, 1896, "the loss of life caused by the tidal wave following the late earthquake in the northern province of Japan amounted to 27,000 victims, besides 8,000 persons injured." No less than 200,000 persons are said to have been killed by the earthquake at Antioch in the year 526. Such phenomena as the foregoing are quite consistent with the action of blind terrestrial powers, but not with that of government by an almighty, benevolent, and intelligent being.

"Junghuhn relates that in Java he saw a vast area entirely covered with skeletons, and took it for a battlefield. They were, however, merely skeletons of great turtles, five feet long, three feet broad, and of the same height, which, in order to lay their eggs, came this way from the sea, and then were set upon by wild dogs, who, with their united strength, lay them on their backs, tear open the lower armour—that is the little shells of the belly—and so devour them alive. But it often happens that a tiger falls on the dogs when so engaged. All this suffering repeats itself thousands of times year after year. For what were these turtles born? For what crime must they endure this torment? For what end this horrible scene?" (Quotation by W. S. Lilly, "The Great Enigma," 1892, p. 252).

Throughout the universe, as far as we know, lesser phenomena yield to greater, and upon this globe "justice" yields to causation; men propose, but the great forces of Nature dispose. There is a frequent conflict between necessity and some of our ideas of right. Life is hard, and painful circumstances frequently occur to most men, whether rich or poor, and but few are able to overcome all its difficulties. It is a waste of energy to oppose that which we are quite unable to prevent or avoid; "necessity knows no higher law," and "it is useless to kick against the pricks." "Afflictions visit the saint as well as the sinner," and we have no choice but either to commit suicide or accept this life with all its difficulties, and struggle through it in the best manner we are able.

Many kinds of living creatures are so constituted as to spontaneously inflict injury upon themselves and shorten their own lives; it is well-known that moths and crane flies ("daddy longlegs") fly into flames of candles and lamps, burn off their wings and their legs, and return again and again until they are completely mutilated and die; some animals also are impelled by their environments to commit suicide. We well know that multitudes of human beings also are only too ready to injure their bodies and minds by means of selfish desires and false ideas. The probable explanation of all such cases is insufficient instinct or intelligence for self-preservation. In a similar manner to the way in which the great bulk of mankind are impelled by physical desire to entail upon themselves disease, and shorten their lives by excess of physical food and drink, so are millions of men and women all over the earth, including members of the many hundreds of religious sects—Mohammedan, Christian, Buddhist, Pagan,

etc.—so organised and influenced by their environments as to be compelled to continually injure their minds by selfish and irrational desires, tempting them to unholy belief of important statements without proper and sufficient evidence to prove them, and even in the very face of sufficient scientific evidence to the contrary.

36. Fallacious Ideas Respecting Justice.

Every human being desires justice, *i.e.*, justice according to his own individual ideas, however narrow or selfish they may be. Treating the subject according to ordinary human views, and not according to scientific ones, we may ask: Where is the justice of creating men imperfect and thereby subjecting them to all kinds of pain and misery? Where is the justice of subjecting all animals to pain by means of great natural phenomena which they are powerless to avoid? Where is the justice of great quantities of wheat being unused in one part of the world whilst famine is occurring in another? Where is the justice of every man, however blameless, being obliged to suffer for the defects and misdeeds of his fellowmen? Why should industrious and careful persons be compelled to support criminals and paupers? or law-abiding persons be obliged to pay police rates? Where is the justice of the immense amount of pain inflicted upon human beings by unpreventible ignorance? and so on. The true explanation of these and many other similar questions is, not that all creation is imperfect, not that "by sin death entered into the world," and that man and all other animals are being punished for man's "original sin," the mere eating of an apple, but that the human idea of justice as commonly entertained is altogether too narrow, and is inconsistent with the great principles of science. According to the principle of universal causation, all the pain suffered by living creatures necessarily arises from the operations of the great forces of the universe and the well-known properties of substances, and what we call "justice" is quite a secondary matter. A great practical and moral lesson to be inferred from this is that we should habitually consider everything more in accordance with its essential, or real value, and less in accordance with its extrinsic, accidental, or factitious importance to us. It is evident from these considerations and conclusions that there is some degree of truth in the sayings, "might is right," "possession is nine-tenths of the law," "men get by might and keep by right," that "he should take who has the power, and he should keep who can," etc.

It necessarily follows that, if the whole system of Nature is one of law and order, entirely governed in accordance with exact, immutable, omnipresent, and omnipotent powers and laws, exempt from supernatural interference, all its phenomena are essentially just. True justice is an accurate balance of pain and pleasure, of advantages and disadvantages, to each and every living creature; and agrees with the fact that without the present 'calamities" there would be greater ones. It is only by living creatures,

by those possessing a brain, that pleasure and pain, advantages and disadvantages, are felt and perceived. The perceptions of pleasure and pain are necessary and opposite states of the same organs; the same collection of nervous organs which enjoy the one suffer the other; without pain there would be no pleasure, without some disadvantage there would be no advantage; a life of unvarying pleasure or pain is an impossibility, largely because perfect "uniformity is death."

Usually our minds are not sufficiently comprehensive to perceive that all Nature's actions are essentially just; and we often cannot comprehend real justice:—(1) because we cannot perceive all the data which are necessary in order to balance the account; (2) because we are all of us very unable to estimate and sum up the values of abstract ideas and incommensurable qualities, such as pleasure, virtue, happiness, freedom from care and annoyance, etc., all of which help to balance the equivalent of pain and suffering, but the laws of Nature do it for us, and give to all men their due; (3) we are much more apt to observe and remember our losses and sufferings than to notice or reflect upon our advantages and blessings; (4) the case is so complicated, abstruse, and comprehensive that even philosophers are unable to make it clear to the understanding of unscientific persons; and (5) the more we investigate the question, the greater the number of phenomena do we find to be really just, and, if we could completely investigate and appraise all, we would probably find all things to be so. The proof of the general statement that all things are essentially just lies in the exactitude and immutability of the great scientific principles of universal relation, causation, continuity, and equivalence of action and reaction; and only scientific persons who are familiar with those principles can best perceive it.

Whilst we readily accept the advantages of inheritance, and the products of the altruistic labours and sufferings of others, we frequently neglect the duty of altruistically working for others in return. Although we have received from our predecessors greater advantages than they inherited, we often do not readily see the justice of working for posterity. Being constantly imbued with narrow, tradesmen-like ideas, we invariably expect a manifest, and usually an immediate equivalent of our sacrifices; and this prevents our realising the comprehensive truth that in the great system of Nature all things are balanced, and that Nature's laws are really just to all men, and every man receives an equivalent although he is unable to perceive it.

Be it ever so "unjust" in accordance with our very limited views, no man can keep to himself all that he actually earns; whether little or much, the laws of Nature compel him to give to those who have less, the rich are compelled to help the poor, the intelligent must give knowledge to the ignorant, those of high social position must aid those of lower standing, by helping them into places and appointments, medical men are compelled by competition and a desire to make their abilities known, to give advice gratis to the poor, in fact, all who have possessions must

sooner or later part with a portion of them directly or indirectly to those who have not. All this must occur in the present state of civilisation whether we consider it just or not; and the fact that it "must be," shows that it occurs in accordance with the great law of causation.

As all men are practically commanded by the powers and laws of Nature, by the rules of morality, and by considerations of their own happiness, to do the greatest good, it necessarily follows that there is some truth in the doctrine of the right of all men, rich or poor, to share the chief advantages of Nature, such as the atmosphere, the light and heat of the sun, the surfaces of the land and water, etc., and that there is a portion of truth in the Socialistic doctrine of the right to share a portion of the products of other men's bodily and mental ability, but in each instance the extent of that right is not an unconditional one as some persons interpret it, but depends upon the whole of the circumstances of the particular case. In deciding the proper limit of this, we consider that a man largely forfeits his rights to live, to equally share the advantages of Nature, or the products of other men's labour and ability, etc., if he is too lazy to work, or if he wilfully omits self-discipline and improvement, or to qualify himself to perform the first duties of life, to obey the chief rules of morality, to fit himself to do good, etc. Nature recognises these, and in such cases of forfeiture it is really not his fellowmen but the powers of Nature acting through them that punish him. Nothing can save the life of a reckless miner who carries a naked flame into a mixture of "fire-damp" and air, or who carelessly and selfishly risks the lives of his fellowmen by lighting his pipe in a fiery mine. He who kills a man wilfully or carelessly renders himself liable to severe punishment, as an example to others not to repeat his conduct. The simple fact that a man cannot obtain as high a rate of wages as he chooses to charge for his labour does not justify him in refusing to work, and throwing himself (his family and other persons) upon the poor-rates, and compelling industrious persons to support him.

The socialist assumption that all men are equal in all things; that one man is as good as another; that all men are entitled to live irrespective of their conduct towards other men; that they should all share alike; that all should receive a minimum wage, or should work only a given number of hours per day; that all men should be equally paid irrespective of their abilities, are all of them largely fallacious, and the chief remark necessary to make respecting them here is, that no two men, no two animals of any kind, nor even two blades of grass, are exactly alike. A man who is idle, thriftless, undisciplined, or spends his wages in riotous living, is not, and never can be, the equal of the industrious, careful, or steady man, and the energies of Nature tell him so by punishing him. If a socialist was asked whether a murderer or a burglar was his equal, he would probably not endorse his own doctrine. Men who make no sacrifices in order to improve themselves, or to improve their children, deserve to suffer, and no efforts of their fellowmen to prevent this punishment can entirely succeed;

the powers of Nature will gradually settle the matter. The true statement of the case is, that all men are equals in some things, but not in others, they are equal in the sense that all are subject to the great laws of Nature, and are equally punished if they violate them through remaining ignorant. If all men are equal in all things, where amongst the believers in that doctrine are the equals in genius of Newton and Shakespeare? The differences of equality amongst men vary in every different case.

37. Scientific View of Good and Evil.

As all things are necessary, all are good.

"All Nature is but art unknown to thee;
All chance Direction which thou canst not see;
All Discord, Harmony not understood;
All partial Evil, universal Good;
And, spite of Pride, in erring Reason's spite,
One truth is clear, whatever is, is right."

—*Pope.*

"This world's no blot for us
Nor blank—it means intensely, and means good;
To find its meaning is my meat and drink."

—*Fra Lippo Lippi.*

According to the late Lord Brougham:—"It is probable that no very satisfactory conclusion will ever be reached by the human faculties of the origin and sufferance of evil" ("Dissertations on Paley's Natural Theology," 1839, vol. ii, p. 1); the "origin of evil" has been called "the one insoluble riddle of all metaphysics and all theology" (Oxenham, *The Open Court*, No. 433, p. 4738). "It is fruitless to expect that science should throw any light upon that greatest of all mysteries—the origin of evil" (Stewart and Tait, "The Unseen Universe," 1876, p. 267). "The origin and mystery of evil, its whence and its why, has always been the crux of the sincerest and profoundest thinkers—the insoluble problem of humanity" (W. R. Greg, "The Enigmas of Life," 1889, p. xvii). "How moral disorder originated in human nature is a problem which philosophy is unable to solve" (Calderwood, "Handbook of Moral Philosophy," 1875, p. 216). "We cannot solve the terrible problem which the evil of the world everywhere presents" (J. P. Cooke, "Credentials of Science," 1893, p. 164). "The real mystery is, not that evil should never have an end, but that it should ever have had a beginning" (Cardinal Newman, "A Grammar of Assent," 1870, p. 393); many other writers have made similar remarks. These statements are much less applicable now than ever they were; science has made considerable advance towards the solution of the question; its true answer is even now becoming clear, and will gradually be perceived by intelligent men. The subject is an extremely difficult one to

make clear to unscientific persons: (1) because it has been greatly mystified by unscientific speakers and writers; (2) because the idea of essential "evil" has become so firmly fixed in the public mind by repetition that it is almost impossible to remove it; (3) because the subject itself is not only very complex, but also abstruse; (4) because it includes a very great variety of cases; and (5) especially because the ordinary meanings of the terms, good and evil, are extremely conventional and indefinite, and vary greatly with the slightest change of any one of the conditions or circumstances. That which may be "evil" and painful to a man, may appear good and pleasurable to his family; that which is painful to a family may be good for a community; that which is a trial for a community may be necessary for the nation; that which may suit a nation may be inimical to the remainder of mankind, and what is considered evil in one age or nation is often considered good in another. That which we term "evil" constitutes a part of nearly all the actions both of animate and inanimate things. When it is said that an action is "bad," it is frequently meant that it is not wholly but relatively bad, or more bad than good.

The origin of the belief in real evil lies in the limited knowledge and power of reasoning of the human mind. The fact, however, that there exists a system of omnipotent powers, acting in accordance with a complete system of laws, necessarily leads to the conclusion that "whatever is, is good"; and it is infinitely more probable that what we, with our feeble intellects and strong feelings, call "evil," is not really so, than that real evil could be due to such a system. If real evil exists, the system of Nature must be imperfect; but the most comprehensive science discloses no real imperfection. The idea of essential evil in Nature depends upon our ignorance; thus, human life, when viewed in the narrow pessimistic aspect, appears bad in almost every way; when viewed in a less contracted manner it is mostly "evil," and "life is not worth living"; when contemplated in a somewhat wider view, there appears to be much more good than evil; but when profoundly studied in the most comprehensive scientific manner, we are driven to the conclusion that whatever is must be, and is essentially good. Whilst most men fancy that they can detect real evil in almost everything, that marvellous reader of Nature, Shakespeare, could perceive "tongues in trees, books in the running brooks, sermons in stones, and good in everything." The difference of appearance of Nature, or of man, when viewed first in the ordinary narrow aspect, and then in the comprehensive scientific one, is often so great that the two appear quite contradictory, and it requires varied and extensive scientific knowledge to discern which is the true one. The idea of "evil" largely arises out of the feeling of pain and the irrational idea that man is of infinitely greater importance in the universe than he really is, and therefore expects to be free from suffering. Man has built up the false idea of "evil" until by its very magnitude, mystery, and darkness, it has blinded him to universal good.

He who finds fault with Nature censures omnipotent power and universal

law. To call any natural action, such as famine, pestilence, earthquakes, droughts, etc., "evil," whilst holding the view of the existence of a personal Creator, shows disbelief in His justice, goodness, and power, because a personal God has feelings, emotions, infinite intelligence, and power; but to call such things "evils," whilst viewing them as results of natural energies acting in accordance with laws, implies no disbelief in their essential justice or goodness, because natural energies and laws have no feeling, emotion, or intelligence, and because the infliction of pain on living creatures is a necessary condition of life and progress.

Whilst the fact that the term "evil" has very different meanings in the minds of different persons, and leads to great confusion of ideas, each of its two extreme meanings, the ordinary and the scientific one, has its uses. The ordinary one, viz., evil is that which produces pain, loss, or discomfort, is of great use in practical life by stimulating improvement; and the scientific one, that "evil" is essential good not understood, is of great value in truly explaining man's essential relations to the phenomena of the universe, in imparting philosophical consolations in great trials; and in increasing the degree of our toleration of the conduct of our fellow-creatures.

The entire mystery of "evil," like nearly all other mysteries, has its origin in human ignorance; there would be no idea of it if all human beings were omniscient, because they would then clearly see that all their actions, mental and physical, are consequences of universal energy acting in agreement with comprehensive laws, and absolutely necessary under the circumstances. The laws of good actions and of "bad" ones; of health and of disease; are the same. Why do we often love what we call "evil" rather than good, and prefer falsehood to truth? it is simply because all our thoughts and actions are necessary consequences of influences acting upon our limited faculties, and cause us to prefer pleasure to pain. Human evolution, however, proceeds irrespective of pleasure or pain; in obedience to omnipotent energy, we are compelled through countless ages to wade through "error" in our progress towards truth, and even now there are many great truths which we cannot adequately realise because of our limited brains and mental powers. In a similar manner we are continually compelled to believe many actions to be inconsistent with truth and goodness which are really consistent with them;—in many cases, false beliefs and "evil" actions are absolutely necessary to compel us to adapt ourselves to our more "advanced" environments, and thus produce greater goodness; if this were not true, various systems of theology would not exist. And as this scientific view of the non-existence of real "evil" is far more consistent with all known truths than the ordinary unproved doctrines of "original sin," the "fall of man," the "innate depravity of the human mind," etc., we are morally bound to accept it and use it in preference to them.

> "There is some soul of goodness in things evil,
> Would men observingly distil it out."

The entire scientific basis of what we term "good" and "evil" lies deep in the properties of material substances, and in the universal ether which enables them to act upon us. The conduct or properties of atoms determine those of molecules; the conduct of molecules and masses, acting through the ether, influence the behaviour of all dead and living things, the conduct and behaviour of inanimate and of animated things determine mental and social actions;—and thus through the whole series of natural phenomena, and of causes and effects, what we term good and "evil" conduct in man, arises originally out of the energies and laws of action of atoms and molecules and of the universal ether.

False or "evil" beliefs, like "evil" acts, have been of vast benefit to mankind in every age, as necessary preludes to and preparation for, more truthful ones, and the very fact that false belief has been of such great use to mankind in controlling their passions, preparing them for further advances in civilisation, and affording them consolation during periods of trial and at the hour of death, ought alone to convince us, not only that "good comes out of evil," but also that seeming "evil" is often real good. Is it any wonder that mankind prefer fallacies to scientific truths when they find that they can understand the former but not the latter, and that the former seems to be the greatest good to them in their special circumstances and stage of knowledge? It is the necessity of false beliefs *for the time being* which justifies theological and other fictions. It could easily be shown that religious enthusiasm, even in promulgating a very imperfect system of ideas, as in the case of the Crusades and in that of the Protestant Reformation, paved the way for more truthful beliefs, and although it is past and gone, it helped, like all other past influences, in making us what we are. Similar to human beings in general recoiling from all that is painful to the body or feelings, whether it is essentially good or not, so the truly scientific mind, seeking pure truth alone, usually recoils from all that is untrue, forgetting that what is untrue may in an ignorant age be a necessary prelude to good.

The ordinary view of good and evil is:—"Good is anything that is true, anything that is right, and anything that supplies our mental and bodily wants."—"Evil is that which is false and unreal, that which is wrong, and the presence of want, either mental or physical" (A. Alison, "History of Civilisation," 1860, p. 85); a manifest defect of each of these definitions is, that we often cannot decide what is false or unreal, and we frequently want that which is not really the best for us; on the other hand, many of our wants are beneficial to us. When a missionary asked a Bushman what was the difference between good and bad, the Bushman replied, "Good is when I take my neighbour's cow, and bad is when he steals her back." Like all other mysteries, that of "evil" is largely due to incomplete scientific investigation. The essence of the matter is, that notwithstanding there is plenty of pain, suffering, and apparent evil, there is no essential wrong; and the pith of the explanation is:—(1) that real evil is self-contradictory and cannot exist because natural law and its contradictions cannot

co-exist; (2) that the more comprehensively we examine cases of suffering, the more all real evil disappears; (3) that what we call "evil" is necessary to life; and (4) that all apparent "evil" is to avoid greater "evil" or secure greater good. "The fact of sin and moral evil is one which few scientific men care to touch" (A. L. Moore, "Science and the Faith," 1889, p. 47); this is largely through fear of exciting ignorant hostility, as well as in consequence of the extremely difficult nature of the subject.

Nearly everybody thinks that there exists something very wrong in the state of society. The almost universal belief at the present time in the existence of evil is like the belief, during the times of Copernicus and Kepler, in the rotation of the heavens round the Earth; as then all unscientifically thinking persons believed that the Earth was the centre of the Universe, and that the latter revolved round it, so now a similar class of persons believe in the existence of real evil simply because they think that they can see it and feel it. As also most pious persons then believed the rotation of the Earth to be a question of theology, so do the same class of persons now consider the question of evil to belong to that subject; in fact, nearly the entire scheme of Christian doctrine is permeated with the narrow-minded idea of the existence of real evil, and includes an extensive system of beliefs in the necessity of sacrifice, prayer, intercession, atonement, forgiveness, redemption, salvation, eternal torment, immortality, a heaven, a hell, etc., all built upon it; the subject, however, belongs to science and natural truth, and not to supernaturalism, because there is nothing supernatural about it. In the times of Copernicus and Kepler, every ordinary person trusted to his unaided senses, and thought he could "actually see" that the Sun, the planets, and the entire starry universe, revolved round the Earth, but he could not perceive that the Earth revolved upon itself because he was carried round with it, and did not sufficiently use his intellect to correct the false impressions of his senses; similarly, at the present time, nearly every such person is prepared to swear to the existence of real evil in all directions, but cannot perceive that the so-called "evil" is a portion of a system of universal goodness, because it requires more comprehensive scientific knowledge than he possesses in order to be able to understand it. He who can clearly perceive the advantages of "evil" is already a considerable philosopher.

> "The riddle of the world is understood
> Only by him who feels that all is good."
>
> —*Whittier.*

> "Cease, fond caviller at wisdom, to be satisfied that everything is wrong;
> Be sure there is good necessity, even for the flourishing of evil.
> Would the eye delight in perpetual noon? or the ear in unqualified harmonies?
> Hath winter's frost no welcome, contrasting sturdily with summer?
> Couldst thou discern benevolence, if there were no sorrows to be soothed?
> Or discover the resources of contrivance, if nothing stood opposed the means?"
>
> —*M. Tupper.*

"Ill blows the wind that profits nobody."
—*Shakespeare.*

"The heart can never a transport know
That never feels a pain."
—*Lyttleton.*

The ordinary theological view of the subject is—(1) that pain and death are evils; (2) that they are punishments for sin; (3) that they are consequences of the original sin of one man; and (4) that all men are naturally sinful, and have inherited a sinful nature. The comprehensive scientific view is—(1) all things and actions are essentially good; (2) that what are commonly called "evils" are apparently, but not really so; they are cases of pain, suffering, or loss, etc.; (3) pain is a real phenomenon, a condition of the nerves or brain; (4) pain and death are entirely due to natural causes, and both are necessary conditions of life, pleasure, happiness, and progress; (5) "sin" is the act of causing pain without proper and sufficient justification; and (6) what we call "sin" and "evil" exist because they are necessary effects of natural causes operating upon living creatures. Very few intelligent thoughtful persons really believe the dogma that sin entered the world through a woman merely eating an apple. As our belief in the existence of essential evil depends largely upon the narrowness of our views of Nature, different men will continue to differ in their views of those subjects as long as their minds differ in their degrees of scientific comprehensiveness.

That there exist numerous phenomena in all directions which we call "evil," and which are painful to living creatures, is manifest to every person, and the term "evil" is necessary to represent them. That all men suffer more or less pain, discomfort, loss, injury, disaster, affliction, difficulty, embarrassment, unhappiness, etc.; and that many have to bear great misery and calamities, undergo the pangs of poverty, hunger, etc., are undoubted facts of incessant occurrence, and these are continually impressing us with the idea of real and universal evil. Science fully recognises all this, but says—

When all is known, and all is understood,
Mankind will see, "whatever is, is good."

It is a scientific truth that the more completely we investigate natural phenomena in cases which are not too difficult for our ability, the more orderly and good are they found to be, and this statement has been proved in all the millions of cases which have been properly and sufficiently examined. If also we believe in the existence of infinite law and order, we must, in order to be consistent, further believe in infinite goodness; and conclude that any apparent exceptions are not real ones. "That is good which agrees with truth. Good is not that which pleases your fancy, however lofty and noble your imagination, and however better, grander,

or sweeter than the stern facts of reality you may deem it to be. You will find that all things that appear good, but are not in accord with truth, are elusive, they will be discovered to be bad; usually they are worse than those things which are bad and appear so to us at first sight" (*The Open Court*, No. 159, p. 2501). If the forces of Nature and their effects were not perfectly harmonious they would be self-destructive, and a single radical evil would disturb the whole; just as the destruction of a single link in a chain or of a single cog-wheel in a machine would destroy the continuity of action. It necessarily follows from the universality of law that all things are as perfect as they can be under all the circumstances and conditions present at the time:—

> "Respecting man, whatever wrong we call,
> May, must be right, as relative to all."
> —*Pope.*

> "Then say not man's imperfect, Heaven in fault;
> Say rather man's as perfect as he ought;
> His knowledge measured to his state and place;
> His time a moment, and a point his space."
> —*Ibid.*

> "Whatever is, is right. This world, 'tis true,
> Was made for Cæsar—but for Titus too."
> —*Ibid.*

> "But sometimes virtue starves, while vice is fed.
> What then? Is the reward of virtue bread?
> That vice may merit, 'tis the price of toil;
> The knave deserves it, when he tills the soil,
> The knave deserves it, when he tempts the main,
> When folly fights for kings or dives for gain,
> The good man may be weak, be indolent;
> Nor is his claim to plenty, but content."
> —*Ibid.*

The existence of universal law and order, and the safety to mankind arising from it, negative the pessimist's view of Nature; and the law of evolution limits the optimist's view of it, by showing that whatever does not agree approximately with the rate of improvement or advance gives rise to conflict or what we commonly term "evil." "If systems that be are the order of God, revolt is a part of the order" (Grant Allen). Dissatisfaction, complaint, contest, and even war, are often necessary preludes to advance and improvement. War is not confined to man alone, it exists amongst animals generally, and even amongst the inanimate elements, in the winds, the waves, floods, the explosions of volcanoes, the rending of rocks by earthquakes, etc. Those persons who condemn war, often inflict as much pain upon their fellowmen either by ignorance, or in the contest for money, as is produced in physical warfare; the chief difference being that in the latter case the painful effects are more sudden and more

apparent, and more strongly excite the feelings of sensitive persons. Complete uniformity of belief would be a great curse; a nation is weakened and its healthful activity is diminished by absence of conflict.

That "evil" conduct in the ordinary sense is not limited to animals, has been extensively observed by the most eminent of naturalists; by Darwin, Wallace, Bates, Waterton, and many others. I quote the following instances:—"In these tropical forests each plant and tree seems to be striving to outvie its fellow, struggling upwards towards light and air—regardless of its neighbours. Parasitic plants are seen fastening with a firm grip on others, making use of them with reckless indifference as instruments for their own advancement. Live and let live is clearly not the maxim taught to us in these wildernesses. There is one kind of parasitic tree, very common near Para, which exhibits this feature in a very prominent manner; it is called the 'Murderer Llana'" (H. W. Bates, "The Naturalist on the River Amazon"). "Throughout the great republic of the forest, the motto of the majority is—'Every one for himself, and the devil take the hindermost.' Selfish competition, overreaching tyranny—'never do for yourself what you can get another to do for you'" (J. E. Taylor, F.L.S., "Sagacity and Morality in Plants," 1891, pp. 234, 235). "So long and so successfully have the Dodder plants practised thievery that most if not all the species would become extinct if they were obliged suddenly to reform and alter their habits of life" (*ibid.*, pp. 247, 248). A whole "host of lower organised plants—the Fungi—never appear to have adopted any other mode of life than that of robbing and murdering, and generally preying upon, plants much higher in vegetable rank than themselves" (*ibid.*, p. 252); "they have been practising the habit for untold millions of years" (*ibid.*, pp. 253, 254). "Degrading poverty so often leads to crime that the same inflexible condition has caused pauperised plants to live by preying upon others, to the detriment and even death of the latter" (*ibid.*, p. 226). "One chief cause of this is inability to compete on equal terms with other plants. Hundreds of species are running a scratch-race for life, and are only just able to keep up with it." "Degeneracy follows, and with it all sorts of vices and dodges to gain a bare living" (*ibid.*, pp. 226, 227). "We have a tolerably large tribe of vegetable robbers whose rootlets feel out for and seize on the roots of other plants. Their flower-stems then rise above the ground, looking as if they had been developed in a fair and honest manner. The most notorious of these parasites are the Broom-rapes" (*ibid.*, p. 249). "They flourish in the midst of plenty, without putting forth any effort of their own, either to assimilate mineral salts from the soil or carbon from the atmosphere" (*ibid.*, p. 250). "In each and all of these instances of vegetable robbery and murder the plants engaged in it have degenerated from higher forms" (*ibid.*, p. 252); they had "to choose between parasiticism or extinction" (*ibid.*, p. 252). One naturalist "found that the insectivorous plants" (Sundews and Venus fly-traps) "suffered from indigestion when they attempted to consume too many flies at a time, and

that some even died from over-eating" (*ibid.*, p. 268). "If we look at vegetable life, we everywhere find misery by the side of grandeur" (Pouchet, "The Universe," 13th edition, p. 369).

The phenomena in the foregoing examples of plant life, although "evil" in the narrow sense of the word, are no doubt "good" in the widest one, because they are necessary consequences of the operation of natural energies in accordance with natural laws; but the following instances exhibit the quality of "goodness" in plants. "No plant liveth to itself alone" any more than does any animal; every living thing works for its offspring. "Among plants the exercise of the principles both of prudence and thoughtfulness has been developed to an extraordinary degree; and there is not a single flowering plant which does not leave a legacy to its descendants, in the store of nutriment associated with its ends" (Taylor, "Morality in Plants," pp. 179, 180). The "eyes" of potatoes "are in reality the parts where growth takes place, the rest of the potato being simply so much starch-food, on which the young plant feeds, as certainly as an infant does on its mother's milk, until it gets strong enough to absorb its own nutriment from the soil." Similarly "in the bulbs of the hyacinth, tulip, the various orchids, etc., a store of starch is laid by for next year saved out of last summer's earnings" (*ibid.*, p. 183). "Plants work vigorously during the summer, against the dark, cold months, and store up an excess of food material to last them through the winter" (*ibid.*, pp. 185, 186). In these, and in various other ways, the moral qualities of men, and the influences which determinate human conduct, can be traced downwards through plants and inanimate substances towards the molecular movements in which they have their origin.

The belief that "whatever is, is good" in cases which we have not yet been able to completely investigate, is like the faith of Columbus previous to his being able to demonstrate the existence of America by actually putting his foot upon it, *i.e.*, we believe in the idea by inference in cases in which we cannot directly perceive it. It also agrees with the fact that the evidence evolved by reasoning, of the existence of things not seen or not understood, is in various cases even more certain than that of our senses, because it is supported by a greater variety of instances. There are plenty of examples of the far greater reliability of the intellect than of the uncorrected senses; for example, time and space, we can neither see, hear, smell, taste, touch, nor in any way directly perceive them, nevertheless, we as certainly know of their existence by the aid of inference as we do that of a lump of gold which we can see, and handle, and put into our pocket. We are as much compelled to believe in universal attraction by the ascent of a balloon as by the fall of a stone; and it is very similar with regard to universal goodness, we are compelled to infer its existence, in order to explain the apparent exceptions in cases of misery, suffering, poverty, and loss. These instances show that the existence of universal goodness may be proved by precisely the same method as that which proved the existence of gravitation, etc. As the system of Nature is one of infinite truth,

and of perfect law, to say that any of the consequences of this are evil is a presumptuous indictment of an infinitely powerful and perfect system or deity by an infinitely feeble mind.

The idea that all actions which produce "evil" effects are really evil is not only very unscientific, but large deductions must be made from our ordinary estimate of its magnitude; first, because "evils" are only "evil" to an extremely minute fraction of existing things, viz., to living creatures; second, because they are only "evil" under very limited conditions, viz., when pain or personal loss or injury is produced; and third, because nearly all men magnify "evil" by remembering more vividly the pains, losses, etc., they have suffered than the pleasures they have experienced and the advantages they have enjoyed.

Men ask, when will pain and "evil" cease? Science replies, not until sensation shall be no more. As scientific knowledge advances "evil" diminishes, and less painful preventives and remedies are required to compel mankind to improve; and in this lies a rational prospect of greater happiness in the future; men must work out their own salvation by useful labour, trusting in omnipotent energy and immutable law for success in their efforts. It is only the most comprehensive minds that are able to see good in nearly everything, the narrower the mind the more readily does it imagine evil. That which is good in one age sometimes ceases to be so in another; as a body in a state of motion must continue in that state of motion until something arises to prevent it, so, whatever is, is good, until something is evolved which is better:

> What is called "evil" is "good" in its day,
> It yields to what's better, then passes away.

The questions of the reality and origin of "evil," instead of being examined upon the basis of comprehensive natural truths and principles, have been treated upon the unsound theory of supernaturalism; it is therefore no wonder that it has remained a mystery, like nearly everything else is which is investigated upon such a basis. Numerous books on the subject have been written, evidently without adequate knowledge of science, and have increased the confusion. It has been examined in the entirely false aspect, that man is the "lord of creation" as if he was the final object of all things; as he is only one out of "360,000" different kinds of living creatures, the question may be asked—Why should he alone be free from pain and trial, and all the others be subject to it?

Good has been defined as "that sort of happiness which all men desire, as being pleasant and agreeable to them" (Cruden); it is, however, manifest that this would include numerous "evil" desires. "The dread of evils is the worst of ills; half of the ills we hoard within our hearts are ills because we hoard them." Pleasure and pain, like good and "evil," are often the same action differing only in degree; "pain is any sensation raised above a certain intensity" (W. H. Hutchinson, M.D., *The Monist*,

July, 1897, pp. 498, 499). Good and evil are largely dependent upon each other; medicines which produce pain at first are often followed by relief afterwards, and in the ordinary sense are both good and evil; punishments are similar. A good thing is that which is suitable for its purpose. Even false theological beliefs, although they have caused and are still causing "religious atrocities," are not essentially evil; they are often necessary in order to produce repentance. Very few persons can at all adequately comprehend complex, universal phenomena, such as universal goodness and the subject of "evil"; and ordinary human judgment, without the aid of scientific knowledge, is not always to be trusted. The conclusion that pleasure and pain are often different degrees of intensity of the same action, is related to the great truth that contradictories cannot co-exist either in a mass or in a molecule.

Man is more blind to the true explanation of "evil" than to almost any other question, because he experiences and sees so much misery, and because he constantly wishes to gain pleasure without undergoing pain to secure it, and this irrational desire has been largely fostered by the habit of selfishly believing in the possibility of obtaining eternal happiness at the expense of the sufferings of another. In consequence of the difficulty of properly interpreting the subject, the truthful idea that all is essentially good, will probably be one of the last to be accepted; but the decay of old beliefs, and growth of new ones, is usually a very gradual process; thus it required several hundred years to explode the belief in witchcraft and in the casting out of devils; in fact, the latter belief still exists, thus Pope Leo XIII, "composed and issued, 19th November, 1890, a formula—'Exorcismus in Satanan et Angelos Apostatas.' His Holiness never fails to repeat this exorcism in his daily prayers, and commends it to the bishops and other clergy as a potent means of warding off the attacks of Satan and casting out devils" (E. P. Evans, *The Open Court*, July 16, 1896, No. 464, p. 4989)!! It is, however, only an example of the common phenomenon of ignorance in high places.

The terms good and "evil" are highly relative, and there is no definite line of division between them; there is no absolute evil, that which is "evil" to one man is often good to another; thus a disease is an evil to a patient, but a source of income to his medical attendant; the possession of money is good when the money is properly used, but it is often an "evil" in the hands of the foolish. The ordinary ideas of "good" and "evil" are also very arbitrary, for instance, someone loses a shilling, a beggar picks it up and considers it quite a godsend; a cyclone damages a city, and all the slaters and bricklayers of the district call it a blessing; a great strike of colliers occurs in England, coals are consequently imported from Belgium, and the coal-miners there consider the strike a good thing. Great changes in manufactures and industries often produce much suffering, but "It is an ill wind that blows no one any good." In an ordinary view an earthquake in any inhabited country would be considered an "evil." The facts that, if there existed no living creatures there would be

no "evil"; and that what is "evil" to one man, or one class of men, is often good to another, are quite sufficient to prove that great calamities are not really evils in themselves. "Things are good to us because our constitutions are shaped to them. No absolute goodness is argued" (*The Open Court*, No. 186, p. 2740). The same natural causes which produce what we term good give rise to what we call "evil"; the same wind which wafts a ship to port detains the outward bound; the same cold atmosphere which kills the feeble invigorates the strong; the sun shines and the rain falls when and where we do not want it as well as when and where we need it. The universe was not created and arranged solely for the pleasure of good men; calamities visit the saint as well as the sinner. Violent, sudden, and fearful phenomena are quite as necessary and natural as the gentle and pleasant ones; the surface of the sun is subject to most convulsive actions.

What we term "evil" is a necessary part of the system of the universe; it is arranged for us, and not by us, and in an infinitely better manner than we could arrange it. The kinds of physical actions which produce "evil" in sentient creatures are identical with those which occur in the non-sentient world, the same storm which hurls an avalanche or uproots a tree produces shipwreck and loss of human life, the same flash of lightning which splits a rock or an oak injures or kills men and animals sheltered beneath it. Precisely similar phenomena which in the case of man are considered "evils," occur in other departments of Nature, and are not considered such. For instance, vegetables of all kinds suffer diseases in great variety and untimely death, and even crystals are liable to diseases and malformations. The struggle for existence, also, and its results, occur with vegetables as well as with mankind, the stronger blades of grass shut out the light from the weaker ones, and cause them to dwindle and die (J. E. Taylor, F.L.S., "Morality of Plants," 1891).

Good in excess becomes evil, extreme virtue becomes vice. The very best of things, even knowledge, act as poisons to persons who have too much of them. Similarly with physical food; at the period of the great French Revolution of 1789, six persons, who had been condemned to death, were promised "that their lives should be spared provided they would consent to live entirely on meat, and to abstain from all liquid for one week," but "before the end of the week five of them were dead, and the sixth survived only a few days longer" (P. Hood, "Treatise on Gout," 1879, p. 238). Excesses are usually "evils":—Too much noise deafens us; too great a distance or too near proximity equally prevents us from being able to see things distinctly; too much evidence wearies us; "too much of truth stuns us" (Pascal); truth which is too pure or too profound repels us, frequently because it exposes our imperfections. Sudden excess of anything is attended by "evil" reaction. As the degrees of pleasure and pain experienced by an animal increase directly as the degree of complexity of its organisation and nervous system, it is not surprising that extremes of pain and pleasure, poverty and affluence, occur in the

most complex communities, and cause some persons to take a pessimistic view of civilisation; similar contrasts of affluence and poverty have been observed by naturalists amongst the great communities of plants in dense tropical forests (see p. 153); it arises largely from crowded competition.

The term "evil" is a very conventional one, its meaning differs more or less in every different nation, and in the same nation at different times; some customs which are considered good in Dahomey and Benin are considered "evil" in England. In order to compare its meaning at a former period in Scotland with that held there at the present times, I quote the following ideas of it held by the Scotch clergy during the seventeenth century. According to those views:—"It was sinful for a mother to wish to have sons; and, if she had any, it was sinful to be anxious about their welfare. It was a sin to please yourself, or to please others; for, by adopting either course, you were sure to displease God. All pleasures, therefore, however slight in themselves, or however lawful they might appear, must be carefully avoided. When mixing in society we should edify the company, if the gift of edification had been bestowed upon us; but we should by no means attempt to amuse them. Cheerfulness, especially when it rose to laughter, was to be guarded against; and we should choose for our associates grave and sorrowful men who were not likely to indulge in so foolish a practice. Smiling, provided it stopped short of laughter, might occasionally be allowed; still, being a carnal pastime, it was a sin to smile on Sunday.

"To write poetry was a grievous offence, and worthy of special condemnation. To listen to music was equally wrong; for men had no right to disport themselves in such idle recreation. Hence, the clergy forbade music to be introduced even during the festivities of a marriage; neither would they permit, on any occasion, the national entertainment of pipers. Indeed, it was sinful to look at any exhibition in the streets, even though you only looked at it from your own window. Dancing was so extremely sinful that an edict expressly prohibiting it was enacted by the General Assembly, and read in every church in Edinburgh. New Year's Eve had long been a period of rejoicing in Scotland, as in other parts of Europe. The Church laid her hands on this also, and ordered that no one should sing the songs on that day, or should admit such singers into his own private house.

"At the christening of a child the Scotch were accustomed to assemble their relations, including their distant cousins, in whom then, as now, they much abounded. But this caused pleasure, and pleasure was sinful. It was, therefore, forbidden; the number of guests was limited; and the strictest supervision was exercised by the clergy to prevent the possibility of anyone being improperly happy on such occasions.

"According to the principles of this new jurisprudence, of which the clergy were the authors, it became a sin for any Scotchman to travel in a Catholic country. It was a sin for any Scotch innkeeper to admit a Catholic into his inn. It was a sin for any Scotch town to hold a market

either on Saturday or a Monday, because both days were near Sunday. It was a sin for a Scotch woman to wait at a tavern; it was a sin for her to live alone; it was also a sin for her to live with unmarried sisters. It was a sin to go from one town to another on Sunday, however pressing the business might be. It was a sin to visit your friend on Sunday; it was likewise sinful either to have your garden watered or your beard shaved. Such things were not to be tolerated in a Christian land. No one on Sunday should pay attention to his health, or think of his body at all. On that day horse exercise was sinful; so was walking in the fields, or in the meadows, or in the streets, or enjoying the fine weather by sitting at the door of your house. To go to sleep on Sunday before the duties of the day were over was also sinful, and deserved church censure. Bathing, being pleasant as well as wholesome, was a particularly grievous offence, and no man could be allowed to swim on Sunday; it was, in fact, doubtful whether swimming was lawful for a Christian at any time, even on week days, and it was certain that God had, on one occasion, shown His disapproval by taking away the life of a boy while he was indulging in that carnal practice." "Whatever pleased the senses was to be suspected. A Christian must beware of enjoying his dinner, for none but the ungodly relished their food" (Buckle, "Civilisation in England," vol. iii, pp. 252-267). These statements are quite sufficient to show that the ordinary meanings of the terms evil and good are very variable and conventional.

The phenomena of "evil" in the form of destruction exist throughout all Nature; substances, both animate and inanimate, are continually injuring themselves and each other; hard rocks and stones crush and reduce to dust the softer ones, stronger plants cause to wither and die the feebler ones, stronger and more able animals kill the weaker ones. In the year 1882, no less than 46,707 head of cattle, and 22,125 human beings, were killed in India by wild animals and snakes (*Calcutta Official Gazette*); and, on the other hand, 18,591 wild animals, and 322,421 snakes, were destroyed by man. The total number of men killed by each other in wars can hardly be summed up, it is so great. Similar phenomena occur with plants.

"What an overwhelming reflection! That the same animal ferocity in pursuing, killing, and devouring, through all the forms of animal life; the same human vices, miseries, cruelties, and crimes that have filled the Earth with groans and lamentations through untold ages; the same inadequate notions and abortive struggles; the same fruitless aspirations and prayers that have been little more than cries of conscious impotence; that all these things have been many times in the infinite past of being, as the result of the same organic combinations that prevail on earth now, and prevail also perhaps at this moment in more than one of the infinite multitudes of worlds that are scattered through infinite space" (Maudsley, "Body and Will," p. 135). "All the horrible and heart-rending things that have ever been in the world—wars, slaughters, tyrannies, tortures; frauds, guile,

intrigues, and lies; lusts, rapes, revelries, debaucheries, thefts, murders, and other crimes—all the offsprings, great and small, open and secret, immediate or remote, of human passions, have been strictly necessary events in the becoming of what is—not to be deplored as accidents, but viewed in tranquil spirit as fulfilments of progress—and will continue to be necessary events thereof so long as the order of progress continues to be human" (*ibid.*, pp. 168, 169).

The opinion that certain natural phenomena such as earthquakes, etc., are really evils, because a small portion of their effects are painful to man, is one of the most firmly established errors handed down to us by our ancestors, and continually promulgated and confirmed by the general assent of mankind; but that which is absolutely necessary is not essentially evil, however painful its consequences may be; and we everywhere see that animals must inflict pain upon other animals and kill them in order to obtain food. "Eat and be eaten" has been termed "a law of Nature." Similarly, if earthquakes did not occur, greater "evils" would probably happen.

The idea that phenomena which produce human pain are evil, is intimately connected with the exaggerated estimation which man has of his own importance, and is largely due to the following circumstances:—(1) Consciousness is only feebly excited by the infinity of time, the immensity of space, the universality of motion, the irresistible power of natural energy, and the immutability of natural law; (2) on the other hand, man is incessantly reminded of his own existence by his consciousness, by his bodily states and desires; he is almost always thinking about himself, what he would like to eat and drink, where he would wish to go, what and whom he would like to see, etc.; all these things being of great interest and importance to himself, but extremely insignificant when compared with the great powers which govern him; and (3) his egoism has been further increased by the doctrine that the universe and all that it contains were specially created for him. Further, poets, literary writers, historians, humanitarians, ministers of religion, actors, and others, have been incessantly talking to him about himself, and increasing his conceit, as if he was the most important of all things, and as if the universe and its great forces and laws were in comparison unworthy of consideration, and that he ought not to be subjected to pain or loss. It is only during a comparatively few years that the great forces and laws of science have in any considerable degree become appreciated by the public, or the public mind has been sufficiently educated to understand them.

Perfect conduct, free from "evil," would require perfect knowledge, but it is well-known that the human brain can only contain a very finite number of ideas; there are plenty of difficult cases in life in which the mere desire to do right is not sufficient, and man's ignorance is gigantic whilst his knowledge is extremely finite. The commission of "evil" is usually a result of ignorance, for if men could in all cases foresee and fully realise all the consequences of their acts, immediate and remote, they

would rarely do wrong. The results, however, of wrong-doing are essentially the same, whether the acts are done intentionally or through ignorance. A fool who does evil acts can frequently not be distinguished from a rogue, because he often acts as if he was one. Every wrong-doer, whether a rogue or not, is a fool because he injures himself by making himself a bad man, damages his reputation, and places himself in the power of his enemies.

Nearly every step in life is a choice between two "evils," thus, if a man wants a coat and is short of money, he must either do without the coat or part with the money; or if a government wants a navy, it must either do without the ships or tax the nation. If we are poor we feel it an evil to part with our money, but we must do so in order to obtain food. Of two unavoidable courses, each of which will produce pain, we usually try to select the one which will produce the least. Man sacrifices millions of insects in order to preserve his wheat, his flowers, and fruit; he kills an infinite number of phylloxera for the sake of preserving his grapes; he sacrifices numberless fish, birds, and beasts to supply himself with food; he imitates Nature; Nature similarly sacrifices tens of thousands of human lives by earthquakes, floods, storms, etc., in order to preserve the balance of terrestrial forces, the objects to be attained being far more important than the preservation of human life; Nature freezes to death thousands of insects per square acre of ground in winter, and sacrifices an infinite number of insects to maintain the life of birds; the ocean is one vast shambles for the slaughter of fish by each other; and throughout all Nature the great moral rule is obeyed, "of two evils choose the least." Notwithstanding the absolute command "Thou shalt not kill," all the governments of the world, Christian ones included, are incessantly killing, and at an immense expense preparing to kill human beings in order to prevent greater "evils."

Nearly every step in life is attended by some "evil"; every advantage by some disadvantage; every improvement by some drawback; for instance, nearly every great improvement in manufacturing machinery has thrown many workmen out of employment, and has ruined employers; but this lesser "evil" was suffered for the sake of the greater good to the greater number, viz., the public. Whether the end will justify the means is often a difficult question, and can only be properly determined by competent examination of all the circumstances of the particular case. If we may not do "evil" in order that good may result, we may not even kill a flea or punish a criminal. "A choice of difficulties seems a necessary condition of human affairs" (Archbishop Whately).

Many men, especially the undisciplined and uninstructed, can only be induced to avoid "evil" conduct by the application of powerful stimulants, and are influenced more by blind sentiment than by the most perfect argument, because through deficiency of knowledge they can appreciate the former more easily than the latter; the pure love of truth is too feeble a stimulus for them; and its reward, although really greater, is often so

distant that they are unable to perceive it or to wait. Without the stimulus of blind belief in everlasting punishment for wrong-doing and in a reward of everlasting happiness for doing better, their minds would not move in the matter. Rough persons require rough treatment to make them move. Similarly, without the stimulus of false ideas and unreasonable expectations, many a large commercial experiment would never be made or a great enterprise carried out; this is frequently illustrated by the tempting but fallacious prospectuses issued by the promoters of new companies. "The only cure for human ills is wisdom" (T. H. Huxley); and that can only come very gradually to the great mass of mankind.

The "universal testimony of consciousness," and the unverified opinions, even of the whole of mankind, must sooner or later yield to the conclusions of perfect inference, based upon sufficient and proper knowledge. Thus, all men formerly believed that the earth was a plane until conclusive evidence and reasoning proved it to be a globe; Melancthon, speaking of the Copernican system, said "the earth can be nowhere, if not in the centre of the universe," and declared that "the earth stands fast, and the sun moves round it" (A. D. White, "The Warfare of Science," 1876, pp. 30, 31). Similarly, nearly all mankind still believe in the reality of "evil" phenomena, and will probably continue to do so until they have sufficiently advanced in scientific knowledge to perceive that all things are good in themselves, including even those terrestrial causes which produce great human suffering.

Human arrangements are permeated in all directions by what we term "evil," and the forms of "evil" are continually changing. Nothing we do or experience is final; we are always advancing towards a more perfect state. All "evils" are preludes to progress; that which is good to-day, or in this age, becomes relatively "evil" to-morrow, or in the next generation. In consequence of the influence of great natural powers upon us we are compelled to wade through error, pain, and suffering in our progress towards truth and happiness, and we have but little choice in the matter. Many of what we call "evil" acts must be committed, and the doers of them punished, as long as men are imperfect creatures. The fact, however, that civilisation advances, proves that the total of good acts of mankind outweighs that of the "evil" ones, for if they did not, we should relapse into a state of barbarism; mankind, as a whole, suffer less pain and "evil" now than ever they did. In most cases we are very apt to underestimate the good if the evil affects ourselves personally, because we remember the pain and fail to remember the pleasure.

> "O yet we trust that somehow good
> Will be the final goal of ill.
> To pangs of nature, sins of will,
> Defects of doubt and taints of blood."
>
> —*Tennyson.*

Throughout all time good has succeeded "evil":—

"The nearer the dawn the darker the night,
And by going wrong all things come right;
Things have been mended that were worse,
And the worse, the nearer they are to mend."

—*Longfellow.*

"I make the poem of evil also, I commemorate that part also.
I am just as much evil as good, and my nation is,
And I say there is in fact no evil;
Or if there is, I say it is just as important to you, to the law, or to me as anything else.
And I will show there is no imperfection in the present, and can be none in the future.
What will be, will be well—for what is, is well.
The difference between sin and goodness is no delusion.
Whither I walk I cannot define, but I know it is to good.
The whole universe indicates that it is to good.
To me there is just as much in ugliness as there is in beauty.
Of criminals, to me any judge or any juror is equally criminal; and
Any respectable person is also—and the President is also."

—*Walt Whitman.*

"I have the idea of all, and am all, and believe in all;
I adopt each theory, myth, God, and demigod;
I believe materialism is true, and spiritualism is true—I reject no part.
I see that the old accounts, Bibles, genealogies, are true without exception.
I assert that all past days are what they should have been,
And that they could nohow have been better than they were,
And that to-day is what it should be."

—*Ibid.*

"I find no hint throughout the universe
Of good or ill, of blessings or of curse;
I find alone necessity supreme."

"The world rolls round for ever like a mill;
It grinds out death and life, and good and ill;
It has no purpose, heart, or mind, or will."

—*Thomson*, "The City of Dreadful Night."

38. Necessity and Justification of Pain and "Evil."

"Nothing useless is, or low,
Each thing in its place is best;
And what seems but idle show
Strengthens and supports the rest."

—*Longfellow.*

Some of the chief justifications of "evil" have already been stated. The most insidious and dangerous "evils" are those in which there is no premonition by means of pain or knowledge to warn us; thus, a secret flaw in a steam-boiler or in the axle of a railway carriage may cause a serious accident. And next in degree of danger are those the evil effects of which do not occur until a long time afterwards, or until it is too late

to correct them, such as neglect of thrift and self-improvement in youth, leading to poverty in old age. Judicious restraint and pain inflicted upon young persons act as preventives of greater pain in later years; just punishment is often the truest mercy, and present "evil" the greatest good. Conflict and pain are the price we pay for life and pleasure; by exciting inquiry they are often a source of truth. "Evil" is often the cause of good; just as "kites rise against the wind," so our noblest abilities are produced by our trials and difficulties.

> "No man is more miserable than he who hath no adversity."
> —*Jeremy Taylor.*

> "Who best can suffer, best can do."
> —*Milton.*

> "The path of sorrow, and that path alone,
> Leads to the land where sorrow is unknown."
> —*Cowper.*

The real causes of pain and "evil" are often obscure. The phenomena of misshaped plants, excrescences on trees, human and other animal monstrosities, cancers, tumours, and various mysterious disorders of body and mind to which human beings are subject, all of which are "evils" to us, are only "exceptional cases," due to the presence of exceptional conditions. The basis of pain and pleasure is the physiological property of irritability, without which there would be no conscious existence or muscular movement; through reflex action it produces molecular motion, and through the medium of sensation it excites mental and bodily action. Insensibility to pain is dangerous; "pain always means something" (W. Hutchinson, M.D., "The Value of Pain"; *The Monist*, July, 1897, p. 497). "Pain is the sentinel of the organism" (Laycock, "Mind and Brain, 1869, vol. ii, p. 35). A patient, the skin of whose legs was insensible, accidentally put his foot into boiling water, and the entire surface of the foot was a complete blister on removing it (A. Combe, M.D., "Principles of Physiology," 1841, p. 72). Many cases have been recorded of lunatics, whose nerves were insensible to pain, who inflicted serious bodily injury upon themselves in various ways by means of fire, cutting instruments, violence, swallowing nails, bits of glass, etc., before they could be prevented. Pain warns all living creatures of peril; the painful sensation of danger compels all animals to flee from its source; in other cases, the pain of a wounded or diseased organ compels them to keep it in a state of rest and promote its recovery. It has been said that "in a world like this a race of creatures that could not feel pain would die out in six months" ("Evil and Evolution," 1897, p. 84). Pain forces men into the path of duty; he who feels not pain or discomfort from his defects fails to remedy them; and he who experiences the pleasure arising from good actions is induced to repeat them. Pain has been called

"the mother of science"; it causes men to acquire knowledge and wisdom, to investigate, discover, and invent. Those animals which most feel the pain of timidity, such as the stag and the hare, are usually the fleetest. "The most timid creatures are the most sensitive" (*The Monist*, p. 499); so also are the most intelligent animals and men. Persons who ail the most often live the longest, because their pains compel them to take more care of themselves; and those who most complain of the pains and "evils" of life are usually those who have not been properly educated and trained. Pain is universally co-existent with animal life, even the most ferocious animals are subject to it; it is a dangerous duty to draw a tooth of a lion, but occasionally it has to be done. "Pain often, indeed, is the protector of the voiceless tissues, and were it not for it and its monitions, much irreparable injury would be inflicted without any consciousness thereof" (J. Fothergill, M.D., "Maintenance of Health," 1874, p. 19). "It is most lamentable to see a child permitted to overrule its parents, disregarding their wishes first, and disobeying their commands afterwards. A weak but natural desire to spare the infant pain is but too often the foundation of a career of self-indulgence, which ends disastrously, involving in its misery alike the mistaken parents and their lost, because indulged, child" (*ibid.*, p. 35). Mankind in general have yet a vast amount to learn of the numerous obscure ways in which pain or what we term "evil" is indispensable to life and happiness; and until they learn it they are not very likely to disbelieve in the existence of essential evil.

"If in creation there were no pain, if no pain could be extorted except by a physiologist, a physiologist inflicting pain, even for the cure of disease or the reduction of death rates, would be an accepted criminal by the general voice of mankind. But Nature is a laboratory of pain on the most gigantic scale; she stands at nothing in the way of infliction; spares nothing that is sentient" (B. W. Richardson, "Biological Experimentation," 1896, pp. 3, 4). "If we think of the pain Nature inflicts it seems far more cruel than any experimentalist can possibly conceive." "It is a moot point whether we ought to attempt to interfere with or lessen the pain of Nature by any method of research, or whether it is not our duty to accept pain as an act of Nature warning us of our errors, and telling us to remove them, rather than try to master pain by entering into experimental conflict with Nature on her own ground" (*ibid.*, pp. 4, 5). "All animals are subject to cancer" (*ibid.*, p. 24). Rheumatism is universal in all persons, and in all climates (*ibid.*, p. 99).

> "Even in the most exalted state,
> Relentless sweeps the stroke of fate,
> The strongest fall."
>
> —*Longfellow.*

"Evil is permitted that thereby greater good may be secured to the universe" (Professor Hitchcock). War, tyranny, and oppression have been

necessary preludes to progress. Barbarous nations are not governed by "rose-water and politeness"; unintelligent persons require to be stimulated by great "evils." The infliction of cholera compelled mankind to discover its preventive, sanitation, after a variety of "pious remedies" had failed. Nothing makes men more careful than want and suffering. The pains resulting from ignorance compel us to seek knowledge. We do many kinds of good acts in order to prevent pain; we provide food for our bodies, houses for shelter and safety, fires and clothing to protect us from cold; we educate and train our children in order to avoid future suffering; we search for discoveries of new truths, and make all kinds of inventions, to reduce the pains and discomforts of life. The educational value of pain or "evil" is enormous. Pain stimulates nearly all our faculties to obey the laws of Nature, to do unto others as we would have them do unto us, otherwise they would inflict pain upon us. It compels us to be industrious, economical, and thrifty. It stimulates the infant to cry for food, and the mother to suckle and feed her infant; and in numerous other ways it is of infinite value to mankind. "If adversity hath killed its thousands, prosperity hath killed its tens of thousands. The one instructs, the other deceives" (Burton). "A God all mercy is a God unjust" (E. Young). Men often improve more by painful methods than by pleasant ones, by making mistakes and experiments than by listening to arguments, because the painful cost of mistakes makes a greater impression upon them; thus, working men are usually benefited more by the privation due to strikes than by all the reasoning of their employers or other persons; but they purchase their knowledge very dearly.

Pain is a great sentinel of bodily health and a premonitor of early danger. Human life would be impossible for any lengthened period of time without the protection afforded by what we call "evil"; familiarity with danger breeds recklessness; if it was not for the restraining and protective influence of pain, and the mental dread of it, which itself is considered an "evil," every human being would unintentionally kill himself by the negligent use of fire, sharp tools, poisons, explosions, and by careless conduct in a great variety of ways; he would injure himself by over-walking, running, and all kinds of athletic exercises and amusements; he would seriously injure his body by over-eating and drinking as long as his appetite prompted him, and by over-indulgence of his sensual desires in every possible way; and even with the protective influence of present pain and the certainty of future punishment, multitudes of men often injure themselves by over-indulgence, and shorten their lives. The evil of punishment has only a partial restraint upon crime; it is more punishment and pain rather than less that is required to protect the worst of criminals from their own evil acts. "Spare the rod and spoil the child" (Butler). If it was not for the so-called evil of instant pain, men would often be fatally injured before they could retreat from the cause of it; they would be burned by fire, poisoned by noxious gases, and in various ways be killed through lack of quick warning of danger; the offensive odour of

coal-gas preserves us from evil because it warns us of the danger of its presence leading to an explosion. There are numerous authentic cases on record of persons, especially insane ones, who have been very seriously or fatally injured by fire, boiling-water, violence, fracture of limbs, unsuspected organic diseases of various kinds, through absence of feeling of pain and of the warning afforded by it (F. Winslow, "Obscure Diseases of Brain and Mind," 1860, pp. 552-555). In all these cases, and in many more, what is commonly believed to be evil is a cause of good, and a powerful motive of beneficent actions. The more complex and valuable the organism the more protected is it by pain; of all animals, man suffers the most numerous "evils" and has the most varied experience of good. Many persons would not perform good acts if they were not stimulated to do so by pleasurable false ideas, and this device is largely acted upon by numerous teachers in order to induce others to improve. Enthusiasts are often stimulated to do good by the influence of false and exaggerated notions. Many of the foregoing remarks, and subsequent ones, constitute a reply to the question—"Why is not man a god, and earth a heaven?" (Pope).

If the present evils did not occur, very much greater ones would happen, if we did not suffer by small earthquakes, volcanoes, hurricanes, floods, etc., greater ones would occur in consequence of larger pent-up accumulations of energy. Even if men lived too long they would get out of harmony with all around them, and would become a source of misery to themselves and to others, and this actually happens in a large number of cases, so that the evil effect of living would be much greater than that of dying. The great majority of persons would not take the trouble to improve, or even to perform the necessary duties of life, unless they were actually compelled to do so by painful or unpleasant experiences. If men were not punished by the greater "evil" of hunger, etc., they would not undergo the smaller one of labour necessary to obtain a living; in fruitful climates men work only about one day each week; and semi-hardy climates are a cause of national prosperity. If they had not suffered the toil and pain of having to make long journeys on foot they would not have invented carriages, railways, etc. And so on, the subject might be pursued almost without end, and in nearly every case we should have to come to the conclusion that what appears to be "evil" is really good. Every painful experience should be turned to good account; and if it is not too heavy to bear, we should be thankful for it. Trials do us good or harm according to the way in which we receive them; "there is nothing like kissing the rod"; one large trial is usually much more easily borne than a number of small ones:

> "Let us be patient! These severe afflictions
> Not from the ground arise,
> But oftentimes celestial benedictions
> Assume this dark disguise."
>
> —*Longfellow.*

Instead of evil making us sad, we should try to be bettered by all that is "bad." If it was not for trials compelling us to change our thoughts and acts, our minds and bodies would become stagnant and unhealthy; the easy acquisition of "an independence" has been a curse to many men.

It is an opinion of many competent persons that "sometimes, though very seldom, it is right to tell a lie to frustrate the purpose of a criminal, or to mislead a murderous lunatic" (Rev. C. Voysey, "Theism as a Science," 1895, p. 34). Every man is occasionally compelled to choose between two "evils"; and provided he chooses the lesser one he is justified by the fundamental moral rule which requires him to do the least harm and greatest good. This rule, however, is a dangerous one when acted upon by ignorant, selfish, or designing persons, and is often greatly abused, because such persons usually think that the greatest good is good to self alone and not to all mankind, themselves included. In past times the opinion was carried to a fearful excess by "religious" persons in the practice of torturing and burning of heretics, and is still greatly abused in the practice of fixedly believing unprovable dogmas; also by making to unlearned men, by Socialist orators, salvationists, and other preachers, deceitful promises which are impossible of fulfilment. The justifications of the murderer, burglar, deceiver, the promulgator of untruths, the fanatic, and the too-advanced reformer are essentially the same, viz., the universal influence of natural compulsion, and the choice of what is supposed to be "the least evil."

Difficulty develops great men. After having passed through one great trial successfully, we are better able to endure and disregard small ones. Without the painful spectacle of vice we could not so fully appreciate virtue. "Good times produce an expansion of life, they develop many varieties of good and evil. Hard times, however, eliminate, they prune the opulent growth, and let the fit alone survive" (*The Open Court*, No. 233, p. 3043). "The internal molecular work done by metals often strengthens and invigorates them" (Roberts-Austen, *Nature*, May 2, 1895, p. 14). "There is no alleviation for the sufferings of mankind except veracity of thought and of action, and the resolute facing of the world as it is when the garment of make-believe by which pious hands have hidden its uglier feature is stripped off" (The Right Honourable T. H. Huxley, F.R.S., *Nature*, July 4, 1895, p. 228). "A wise man owes more in self-culture and worldly success to the disappointments and griefs which he has suffered than to the triumphs and joys which he has had" (Maudsley, "Physiology of Mind," 1876, p. 387). Difficulties are not evils to those who meet them in a proper manner. "Suffering is necessary for the development in us of pity, mercy, and self-sacrifice, which are the noblest and most godlike of all the emotions" (A. Momerie, "The Origin of Evil," 1883, p. 20). Affliction produces resignation (*ibid.*, p. 21).

"Sweet are the uses of adversity,
Which like the toad, ugly and venomous,
Wears yet a precious jewel in his head;
And this our life, exempt from public haunt,
Finds tongues in trees, books in the running brooks,
Sermons in stones, and good in everything."

—*Shakespeare.*

"For naught so vile that on the earth doth live,
But to the earth some special good doth give."

—*Ibid.*

Deficiency of fundamental scientific knowledge causes us not to recognise the necessity of "evil." All men must commit "evil" acts in consequence of ignorance, and if a man did no good action until he could do one perfectly free from "evil" effects he would never do one at all. "He who makes no mistakes will make nothing." Instead of attributing our trials to unprovable causes, such as "original sin," the "fall of man," the "displeasure of God," the "suggestions of Satan," etc.; we should attribute them to natural ones, the existence of which has been fully proved and are reasonably competent to explain them. Death, which is usually considered a great evil, is as necessary as life, and according to the uniform testimony of medical men, is only in a small proportion of cases attended by pain to the dying person; it is the surviving relatives who usually suffer the most.

The restoration of balance of terrestrial energy is far more important than the preservation of human life. Volcanoes are essential to the safety of the earth; they act as safety valves, and prevent more enormous explosions. According to Lyell:—"The general tendency of subterranean movements, when their effects are considered for a sufficient lapse of ages, is eminently beneficial, and they constitute an essential part of that mechanism by which the integrity of the habitable surface is preserved."—"At first sight it may appear paradoxical to assert that earthquakes, fearfully destructive as they have often proved, are yet essentially preservative and restorative phenomena; yet this is strictly the case. Had no earthquakes taken place in olden times, men would not now be living on the face of the earth; if no earthquakes were to take place in future, the term of man's existence would be limited within a range of time far less than that to which it seems likely, in all probability, to be extended" (R. A. Proctor, "Light Science for Leisure Hours," 1871, pp. 190, 214). The germs of so-called "evil" are to be seen in inanimate nature; the collisions and friction of stones, the rusting of metals, etc., are much like the conflicts of animals, and the diseases of men.

"If plagues or earthquakes break not Heaven's design,
Why then a Borgia, or a Catiline?"

—*Pope.*

We are frequently compelled in practical life to inflict pain upon others in order to produce some good effect; thus, a surgeon performs a painful operation on a patient for the purpose of benefiting or curing him. The entire system of legal punishment, which is in itself considered a very great "evil," is justified both by necessity and by the general approval of mankind, and is almost entirely for the purpose of preventing the commission of still greater crimes. A person is usually held blameless for punishing another, provided the punishment is accurately proportioned to the offence. When the prosperity of a nation declines, it is best for the nation that it should do so, because the pain and punishment thus inflicted upon it by natural causes stimulates and ultimately compels it either to reform or die out. Some persons still believe that even murder may be committed in order to "save souls," and that any cruelty may be perpetrated for the "good of the Church"; take for instance the recent burning of ten "heretics" by a Catholic judge in Mexico (see section 56); but in this case the punishment was based upon a false hypothesis, and was altogether too great for the imaginary crime.

It would not be difficult, but it would be a very tedious undertaking, to show that probably all what we term "evil" is really good, either by preventing greater "evil" or by causing greater good. Thus death is almost universally considered an "evil," but, if men had not died, there would, long before this time, have been an altogether insufficient supply of food for them; similar remarks would apply to each of all the very numerous kinds of living creatures. "There is no exception to the rule that every organic being naturally increases at so high a rate, that, if not destroyed, the earth would soon be covered by the progeny of a single pair. Even slow-breeding man has doubled in twenty-five years, and at this rate in less than a thousand years there would literally not be standing-room for his progeny" (Darwin). The same may be truly said of a multitude of different kinds of plants. It has been estimated that a single pair of common house-flies produce at least twenty millions in a single season; and if the whole of the ova of cod-fish developed into the adult state, the oceans would become entirely filled with them. We know the great evil effects of Australia being over-run by rabbits, the devastations caused by swarms of locusts, etc., and it is evident that unless animal life generally was destroyed, and the rate of destruction regulated, the great waste of life which we consider "evil" would be replaced by "calamities" of far greater magnitude. According to Leuwenhök, out of eight or nine millions of eggs of cod-fish not more than two fish arrive at maturity ("Evil and Evolution," 1897, p. 119).

Waste is usually considered an "evil"; but what is waste? in its narrow, or ordinary sense, it is matter, energy or thought, expended partly or wholly in ways we do not wish; for instance, the best steam-engine "wastes" eighty-seven per cent. of the energy of the coals. The term is one of that numerous class which has two widely different meanings; it has the narrow, ordinary, and easily understood one, and it has the com-

prehensive, essential, and scientific meaning. As there is no real destruction of matter or energy, there can be no real waste of either, and what we usually call waste is only change or redistribution of such a kind as inflicts loss, discomfort, or pain upon mankind; all things in Nature, even the vast number of unproductive seeds of plants, and eggs of animals, are sooner or later used; thus wasted leaves form useful coal, and useful food for plants. In the present childhood of mankind we are compelled to employ narrow meanings to terms, to measure all things by our own little selves, and like the use of little "go-carts" by infants to enable them to walk, so we employ narrow meanings to words because we can immediately use them, and because we cannot understand wider and truer ones. In the narrow meaning of the term, we see waste almost everywhere, waste of material, of terrestrial and solar energy, of fuel, of sewage, of human strength, feeling, and thought, and this narrow idea stimulates us to utilise and economise all things around us, to discover, invent, diffuse knowledge, and to personally improve. It is an important duty therefore to understand the narrow as well as the comprehensive meaning of "waste." "Waste not, want not," is a largely recognised maxim. As mankind advance in knowledge the greater good effects of what we call "evil" and "waste" will be more clearly perceived, until the majority of persons will arrive at Pope's conclusion that "whatever is, is right." Luxury is "waste" of money, not doing the greatest good with it.

The so-called "evil" of discontent and complaint is not a real evil, but a necessary effect of natural causes; society could not exist without it, when we feel injured we are compelled to cry out. Its excess is a very general affliction, especially of those who have not succeeded in life, of those who have not sufficiently comprehensive knowledge to perceive that "all things work together for good." As it is a necessity of life it is justifiable, but like all other human actions it has rational limits; we should not employ it unless it is likely to do more good than "harm," and only under proper conditions and circumstances. If we were never discontented with our own conduct and circumstances, we would not try to improve, and if we never complained of the conduct of others they often would not improve. Life is more for explaining than for complaining. As all persons do as they must, the only justification for blaming them is to induce them to improve. It is usually considered quite justifiable to inflict a smaller pain, in order to avoid or prevent a greater one, and this truth is very generally recognised in surgical operations; in the slaughter of animals for food; and by those who understand the subject in so-called "vivisection" experiments for acquiring useful knowledge.

Nearly every man, whatever his religious or other profession may be, will fight for his life and his income; even the professed opponent of war, the Quaker, will establish a reserve-fund with which to maintain a monopoly in his business by starving out all who attempt to engage in the same kind of manufacture; and this illustrates the fact that the great energies of Nature acting through us, overpower our narrow "principles," and expose

the hollowness of irrational professions; it has been stated that a great number of falsehoods were told by "friends" in America in order to assist the slaves in escaping from their employers.

In the ordinary or narrow sense, it is often considered an "evil" to have to suffer for the benefit of others, but individuals are frequently compelled to make sacrifices for the good of the community, or the community for them, whether they are willing or not; for instance, they are obliged to part with their land if it is required for making a road or a railway; or, if a man digs a well, he diminishes the supply of water to the wells of his neighbours, and his neighbours can usually obtain no redress. If a man possesses money, knowledge, or social influence, he is constrained by natural influences to sacrifice it, to a large extent gratuitously, for the benefit of his fellow-creatures. The energies of Nature also, in the form of "influence of environment" acting upon ignorant and untrained minds, give rise to great social "evils" such as nihilism, fenianism, anarchism, socialism, the Irish Land League, moonlighting and assassination societies, and excite the feelings of the poor classes against the rich ones, to compel the latter to give to the former. The same omnipotent powers acting upon brains strongly impressed by unprovable sectarian beliefs have produced the most fearful "evils" and crimes in the form of "religious wars," the burning of witches and heretics, "Armenian atrocities," etc. All these instances are more or less justified by necessity, and each has to be judged upon the whole of the evidence.

It is well-known that the judgment of untrained and inexperienced persons cannot be depended upon in cases where knowledge or wisdom is necessary, and the justification of the practice of keeping such persons ignorant is that they must be prevented from causing "evil" and making mistakes. As children are not permitted to have possession of, or to use poisons, pistols, gunpowder, matches, razors, etc., so ignorant persons are not permitted to exercise as much power as intelligent ones. Great "evil" has been done in some cases by giving to such persons a too extensive franchise, because they have allowed themselves to be duped by unprincipled orators to vote for incompetent members of parliament and of governing bodies of all kinds, thus producing corrupt government. Partly in this way the municipality of New York City became corrupt under the management of Messrs. Tweed, Sweeney, and others, doing great injury to the inhabitants during many years, and the corrupt officials were with very great difficulty ousted. In a similar way, medical men dare not trust beyond a certain extent unintelligent patients and do not allow them to know the composition of the medicines or the real nature of their complaints, lest they may draw some erroneous conclusion and frustrate their own recovery. The Roman Catholic laity also are treated by their priests as if they are unable to take care of their minds, and are commanded not to read certain books or reason for themselves on certain subjects lest they may acquire heretical ideas. In each of these ways, and in many others, knowledge and power are withheld from the ignorant and weak and kept

in the hands of the learned, the wealthy, and strong. The method of keeping men poor in knowledge, money, and power, in order to prevent them doing harm is, however, often a remedy worse than the disease. Every person should be allowed a fair chance of improvement, a fair trial of increased knowledge, money, and power; this is the rule universally adopted in the education and training of children, and must be gradually adopted with older persons, and those who are incorrigible will be weeded out by the operation of natural powers, just as the uncivilisable Indians and others who persistently oppose the progress of civilisation are being gradually exterminated. If men are not allowed to acquire knowledge or power until it is certain they will use it aright, they will never acquire it at all. It is a case of the usual problem of life, viz., a choice between two evils, viz., that of greater ignorance and the crimes, etc., which result from it, and that of more temporary evils arising from abuse of newly-obtained power; that the former is in some cases the greatest is plainly shown by the permanently stagnant and miserable condition of the inhabitants in various Roman Catholic countries. The proper rule of guidance lies in obedience to the great scientific law of evolution, *i.e.*, to trust the ignorant judiciously, and compel them to use their freedom rightly. The justification of "evil" in each of the foregoing cases depends upon the whole of the evidence in the particular case.

It may be remarked that if we could sum up and separately determine, on the most comprehensive scale, the total advantage and disadvantage to mankind, of all the actions which we term, "good," and of those which we call "evil," and strike a balance between them, there would remain a justification of "evil" in the form of a surplus in favour of the best rate of human progress and civilisation. Our mental powers are, however, altogether too feeble to do this, but Nature practically does it for us, and the favourable balance is proved by the fact that notwithstanding the enormous amount of "evil" which exists, mankind has greatly advanced in material, mental, and social well-being, from the earliest known periods of human history until the present time. The question has been asked, "Why were not all men created perfect?" the scientific reply to this is, if all men were perfect they would be without the pleasure of self-improvement; and the justification of the pain and "evil" necessary to progress is the greater pleasure which attends the advance of civilisation at the resulting rate. In an incomplete state of civilisation, and therefore always, the omnipotent influences of Nature compel every person to do everything imperfectly, but not essentially so because it is suited to the circumstances and the stage of advance. Some of the greatest impostors have been men who have done much good to mankind.

It is not surprising that man, a mere speck in the universe, so limited in mental power, subjected to so much pain and surrounded by evidence of it almost everywhere, should be unable to fully comprehend the infinitely great and complex system of Nature, or to believe in the existence of universal goodness. It necessarily follows that those who know least of

the great energies and laws of the universe are the least able to appreciate the perfection of Nature or of the Creator they worship. In accordance with this statement, we find the greatest believers in real evil and disbelievers in universal goodness are usually the most ignorant, the most unscientific, and often the most professedly pious persons.

After the various statements made in this and the immediately preceding section, showing the great difficulties of the subject, it is also not surprising that unscientific persons have not been able to make the subject of "evil" more clear, nor that "the existence of evil in the world is the standing riddle of all ages" ("Evil and Evolution," 1897, Preface, p. 1). According to one writer: "We can neither explain nor justify the existence of pain" (Leslie Stephen, "Social Rights and Duties," 1896, p. 228).

> "All is best, though oft we doubt
> What the unsearchable dispose
> Of highest wisdom brings about,
> And ever best found in the close."
>
> —*Milton.*

> "In this first
> Life, I see the good of evil, why our world began at worst;
> Since time means amelioration, tardily enough displayed,
> Yet a mainly onward moving, never wholly retrograde.
> We know more though we know little, we grow stronger though still weak,
> Partly see though all too purblind, stammer though we cannot speak."
>
> —*Browning.*

39. The Apparent and the Real.

The extreme feebleness of human powers in relation to the magnitude and complexity of Nature renders false and superficial our views of many things; it is the origin of our belief in the existence of real evil and in a large number of other unprovable ideas. It compels us to magnify the importance of little things, and diminish that of great ones; to view complex questions as if they were simple; to be guided by narrow empirical maxims instead of by comprehensive principles, and by the apparent instead of by the real. In many subjects there are instances in which a superficial examination leads to an exactly opposite conclusion to that arrived at by a full investigation; and there still remain a large number of complex and obscure phenomena, the true interpretations of which are not generally understood.

Realities are often different from appearances; for instance, both the sun and the moon appear larger and of a redder colour when near the horizon than when they are high in the heavens, although their real magnitudes and colours remain the same. When the sun appears to be just above the horizon at the period of setting, it is really beneath it; and when

it only just appears above the horizon on rising, it is at a higher position. A red-hot object whirled in a circle appears to be a continuous circle of light. A very rapidly intermittent spark seems to be continuous. A red-hot wire looks much thicker than it really is. Sheets feel colder than blankets, and flannels feel warmer than linen, when both are really at the same temperature. If we immerse one hand in water at 80° Fahrenheit, and the other in water at 120° Fahrenheit, and after a short time transfer both hands into water at 100° Fahrenheit, the latter liquid will feel hot to the cold hand, and cool to the warm hand. Everybody knows that a man may appear to be very honest and yet be a very great rogue. Phenomena which are essentially the same often exhibit no apparent likeness, thus the slow rusting of iron and its vivid combustion in oxygen appear to have no resemblance. Many substances also are essentially alike which appear different; for example, a diamond and a piece of charcoal appear to be entirely different bodies, but chemical research has demonstrated that they are the same elementary substance. Essential resemblances, as well as essential differences, are frequently difficult to detect, and the more fundamental the nature of the difference or similarity, the more hidden usually is it from our view by other phenomena which more affect our senses; thus pain often appears to be an evil, even when it is really doing us good.

"Seeing is believing," but unfortunately we cannot always trust what we see without the correction afforded by greater knowledge and inference; for instance, when we look at the most distant stars, even with the aid of a powerful telescope, we do not see them as they are now, but as they were fifteen or twenty years ago, because it takes that period of time for the light to come from them to us; and in the meantime, some of them may have greatly increased in brilliancy, and others may have become dim or quite died out, as some are known to have done. "Judge not according to appearances" (St. John, chapter vii). "All is not gold that glistens" (Middleton). In multitudes of so-called miracles, the popular explanation has not been the true one, and many of our present "religious" beliefs are equally misleading. It is well-known that tradesmen frequently employ mirrors for the purpose of making their shop and its contents appear larger than they really are. Brass is often coated with a film of gold to make it look like the more valuable metal. In some pious hopes, imagination "lends enchantment to the view." Whilst we readily perceive the optic images of bodies, we scarcely at all perceive those of heat, and not all those of gravity which proceed from them.

Among less simple cases are the following:—The apparent cause of the great explosive force of gunpowder is in the spark which ignites it, but the real cause is the stored-up energy of the powder. The friction of a lucifer match appears to cause the flame, but the real cause of the flame is the stored-up chemical energy of the match composition, and the friction only liberates it. An exciting condition is often a very minute one, but it may be followed by a long train of events. "For want of a nail the shoe was

lost; for want of a shoe the horse was lost; for want of a horse the rider was lost; and for want of the rider the battle was lost." A very small and apparently innocent action may be a real and fatal step on the road to ruin. Powerful volitions are often started by imperceptible causes.

We are continually liable to over-estimate the real magnitude of sudden and conspicuous phenomena, and underrate that of slow and unobtrusive ones; the most important phenomena, however, are the gradual, never-ceasing, and feeble ones; thus it is not earthquakes which have the greatest effect in altering the geological surface of the globe, but the feeble action of air and water, which, without cessation, disintegrates the surface of the earth and rocks, and is constantly carrying solid matter into the ocean; and it is the immense weight of this solid matter in the bed of the ocean which lifts the adjacent shores into mountains, and enables earthquakes and volcanoes to be produced; in this way the Pacific Ocean is continually raising the Andes. The grand cañon of the Colorado river in Arizona is a sublime example of the great effect of long-continued feeble causes; throughout a distance of more than three hundred miles the river has during an immense period of time gradually corroded away the rocks, until an enormous gorge, varying from 4,000 to 6,000 feet in depth, with nearly vertical cliffs on each side, has been formed, the high table-land or plateau gradually elevating, and the river washing away its bed as fast as the latter has risen.

One of the most extensive and misleading deceptions, produced by mistaking the apparent for the real, is that in which the operations of instinct appear to be those of intellect. A very striking description of this is given by Dr. Laycock, who states that instinct "works with an apparently perfect knowledge of all the sciences, *i.e.*, of number, geometry, mathematics; chemistry, electricity, magnetism, mechanics, hydraulics, optics, acoustics"; a similar remark might with equal truthfulness be made respecting the numerous apparent phenomena of choice, etc., exercised by inanimate bodies (see section 49). It is because the great powers of Nature act with certainty, perfection, and completeness, even to the minutest detail, and largely in accordance with human intellect, that mankind are misled to conclude that the universe is moved and directed by an infinite, omniscient, omnipotent, and omnipresent mind. The simple facts that inanimate substances in the form of a phonograph can talk, shout, groan, shriek, and sing; in that of a cinematograph, can exhibit all the movements of men, animals, and inanimate bodies; in the logical machine, can reason accurately, and, in some cases, even more reliably than human beings; in the form of steam-governors, gas and water regulators, the regulators of clocks, watches, musical boxes, etc., can control their own actions; that crystals during the act of formation, and vegetables during that of growth, can select their own nutriment; and numerous other examples, ought to suggest to us that all the phenomena of Nature around us may be due to inanimate powers acting in accordance with a perfect system of laws, instead of being due to an universal invisible intellect, the necessary nervous

organ of which is nowhere to be found. In all such cases of belief in the existence of a hidden, inscrutable, universal, governing intelligence, and of fruitless search for it, men behave much like the monkey, who, when listening to the chatter of another monkey, recorded and emitted by a phonograph, thrust his arm down the trumpet of the machine, in search of the creature whom he supposed to be inside, but whom he was unable to find. Additional instances of simulation of intellect by inanimate bodies and by plants are given in subsequent sections of this book.

In consequence of the greater conspicuousness of appearance than that of the reality, the evil effects of over-drinking appear to be greater than those of over-eating; it is probable, however, that human life is shortened more by habitual immoderate eating than by intemperate drinking, and that we notice the effects of the latter more than those of the former, because they are more sudden and conspicuous; we know that liquids pass through the human body more easily than solids, that the evil effects of excess of solid foods are usually more permanent than those of stimulating liquids, and still more so than those of exciting gases. The real cruelty of women towards men is much less apparent than that of men towards women, largely because it shows less external evidence. The apparent value of a scientific truth is often very different from the real one; it is usually smaller the more important the truth, because it is then less easily understood; for instance, the apparently valueless fact of the attraction of a feather by a piece of amber which has been previously rubbed, gave rise to the entire science of electricity; the simple fact that the motion of a magnet produced a minute momentary electric current, originated the dynamo and electric-lighting; the apparently insignificant fact that an electric current decomposed a chemical solution, was the original source of the science of electro-chemistry, and of the great manufacture of electrolytic copper.

There remain various much more complex cases in which the apparent explanation is still believed by multitudes of persons in preference to the less easily understood scientific ones. Amongst these are beneficent design; the existence of essential evil; the relative greatness of man in the universe; the infallibility of "conscience"; freedom of the human will; the immortality of the soul; the possibility of "miracles"; the existence of spirits in space, etc., etc., and the erroneous idea that science can throw no light upon these subjects.

The difference between the apparent and the real is a source of great difficulty in giving true descriptions of things, because the same word has often to be employed with two different meanings; thus, the word "evil" may mean either apparent evil or real evil; the words truth, justice, goodness, etc., similarly; the apparent being usually the unscientific and narrow meaning, and the real being the scientific or most comprehensive one.

"In law, what plea so tainted and corrupt,
But, being seasoned with a gracious voice,
Obscures the show of evil? In religion,
What damned error, but some sober brow
Will bless it, and approve it with a text
Hiding the grossness with fair ornament?
There is no vice so simple, but assumes
Some mark of virtue on its outward parts."
—*Shakespeare.*

"Not always actions show the man; we find
Who does a kindness is not therefore kind;
Perhaps prosperity becalmed his breast,
Perhaps the wind just shifted from the east;
Not therefore humble he who seeks retreat,
Pride guides his steps, and bids him shun the great;
Who combats bravely is not therefore brave,
He dreads a death-bed like the meanest slave;
Who reasons wisely is not therefore wise,
His pride in reasoning, not in acting lies."
—*Pope.*

"A saint in crape is twice a saint in lawn."
—*Ibid.*

"The world is waking from its phantom dreams,
To make out that which is from that which seems."
—*Gerald Massey*, "The Coming Religion."

40. Position of Man in the Universe.

As the general plan of a city cannot be realised by walking about in its streets, but only by viewing it from suitable elevations, so the real position of man in the universe cannot be ascertained by mere self-contemplation, nor by studying man alone, but only by studying him and the external universe, and their relations to each other, from every chief mental position.

"It is dangerous to show man how much he resembles the beasts without at the same time pointing out to him his own greatness. It is also dangerous to show him his greatness, without pointing out his baseness. It is more dangerous to leave him in ignorance of both. But it is greatly for his advantage to have both set before him" (Pascal's "Pensées"). "The great business of life—even that which lies immediately before us—will be more fully understood and more rationally performed, the better man knows the place he holds and the relations he bears to the plan of creation" (D. Page).

Previous to modern developments of science, men's minds were almost entirely occupied by subjects which related chiefly or wholly to man, such as history, literature, theatricals, amusements, politics, law, theology, metaphysics and medicine. By historians, literary men, and actors, man's

mind has been saturated with the narrow belief that the "proper study of mankind is man," as if the universe was quite a secondary matter; and by theologians, with the false notion that "nothing is equal in importance to a human soul," as if the whole of the universe was of less importance than a single human mind!! One consequence of this has been, that man in general has acquired an altogether too great opinion of his own importance and an infinitely too small a one of the universe. A single man on the earth, however, is like a microscopic insect upon an enormous balloon; the entire population of the globe, consisting of about twelve hundred million persons, constitute only about a hundred million millionth part by weight of the earth, "the total weight of the earth is 6,069,094,072 billions of tons," and its volume is "259,800 millions of cubic miles"; yet the earth itself is but a mere speck in the universe, one very small body amongst myriads of large ones, and even "the heavenly bodies are scattered in space like dust in the air." But notwithstanding these facts, in this age, with all the developments of science around us, any subject which does not, in the view of unscientific minds, manifestly affect men, is largely neglected, no matter how important it is in itself, and really to mankind. The study of "the humanities," and of all that conspicuously relates to man, has very largely absorbed men's attention, whilst that of the great energies and laws of the universe which really affect him far more profoundly has been and is greatly neglected.

The praises of man have been incessantly sung, and his actions exhibited in every conceivable form, whilst subjects of vastly greater intrinsic importance have been almost entirely ignored; we cannot pass along a street without seeing theatrical posters representing some man or woman doing some unimportant or ridiculous action. Whilst the results of new knowledge far exceed in importance, reality, sublimity, utility, and romance the greatest conceptions of dramatists, painters, novelists, musicians, and poets, the great truths from which they have sprung remain largely unappreciated, not only by the multitude, but even by very many of the otherwise educated classes of the community. Where is the poet who has adequately rendered into verse the birth, growth, and wonderful development of great scientific truths? or adequately pictured the gradual evolution of knowledge?

> "Perhaps there lives some dreamy boy, untaught
> In schools, some graduate of the field or street
> Who shall become a master of the art,
> An admiral sailing the high seas of thought,
> Fearless and first, and steering with his fleet
> For lands not yet laid down in any chart."
>
> —*Longfellow.*

Why is it that the teachers of theology and morality generally have not made themselves more acquainted with the great principles of science, upon which not only the chief rules of morality, but also their own professions, viz., religion, are based? It is largely because the attractive idea

of human importance has clouded the intellects of men, and thus shut out from view the truths of infinitely greater magnitude :—

> " Ask for what end the heavenly bodies shine,
> Earth for whose use ? Pride answers, 'Tis for mine."
> —*Pope.*

> " Seas roll to waft me, suns to light me rise ;
> My footstool earth, my canopy the skies."
> —*Ibid.*

" Science is impersonal ; it tends to belittle and diffuse man ; theology and literature tend to exalt him, and concentrate him, and set him above all. Mythology, theology, philosophy, literature, all exaggerate man and distort his true relations to the universe ; but in these latter ages comes science, and shows man what he really is, and what a minute bubble is the world which he inhabits " (*The Open Court*, No. 186, p. 2739). If you wish to become learned and happy, try to realise your true littleness. Neither literary, theological, historical, theatrical, or legal studies penetrate like science into the foundations of things by means of proper and sufficient evidence.

Under these conditions the minds of nearly all men are " cribbed, cabined, and confined," to more or less merely personal matters to such a degree as to be almost entirely unable to realise the true position of man in Nature. But science is gradually diminishing this ignorance and conceit ; it discloses the phenomena of infinite time and of unlimited space, the geological and astronomical phenomena which extend over vast periods of time ; it shows us, by means of the telescope, spectroscope, and photography, the heavenly bodies, their chemical composition, and their changes throughout vast distances of space ; it exhibits the minute structures and actions of all solid substances, living or dead, by means of the microscope and spectroscope, and it examines the numerous properties of an endless number of substances by means of physics and chemistry. It provides man with new and less foolish occupations ; it gives him more noble objects of admiration and worship ; it gives increased truth, certainty, goodness, energy, diversity of pleasures, and scope for improvement.

The late Cardinal Newman said that " the destruction of the world was a less evil than a single mortal sin " (Percy Greg, " Without God," 1883, p. 302) ; *i.e.*, " a sin punishable by death " is a greater evil than the destruction of this globe and the twelve hundred million human beings, and the myriads of other living creatures upon it !—to such irrational conclusions do beliefs in unprovable theological hypotheses lead the minds of the best intentioned men. The earth is, however, vastly more important than an individual man, because it is unmeasurably more powerful, because it could exist without him, but he could not exist without it ; and because it enables thousands of millions of men to live.

A great fabric of error has been raised upon the extensively believed,

flattering, and enormously conceited assumption that "all things were created for man." The revelations of science, however, have proved to us that this statement is extremely erroneous. They have shown to us that man is only one amongst about "360,000" different kinds of living creatures on this globe (see *Nature*, vol. liii, p. 541, April, 1896); that this globe itself is only one amongst countless millions of worlds; that if it was to explode and disappear, as some are believed to have done (see p. 87), or be burned up by a sudden increase of temperature of the sun, all living creatures upon it would perish, and not only man, but even the earth itself, "and all that it inherit," might disappear in vapour, and would not be missed in the universe. The death-rate of all mankind has been estimated to be at least sixty each minute (P. Hood, "Treatise on Gout," 1879, p. 382); or 31,536,000 each year. We might therefore ask with the Psalmist, "what is man?" also what is the relative importance in the universe of a single individual or soul? Whilst, however, each man is but a mere speck in the universe, he is all in all to himself, and should carefully study himself and his relations to all things in order that he may be better able to act aright; that such a study is necessary is shown by the punishment which follows its neglect, and by the irrational beliefs of unscientific minds.

"Men die and are forgotten. The great world
Goes on the same. Among the myriads
Of men that live, or have lived, or shall live,
What is a single life, or thine or mine,
That we should think all Nature would stand still
If we were gone? We must make room for others."

—*Longfellow.*

"Has God, thou fool! worked solely for thy good?
Thy joy, thy pastime, thy attire, thy food?
Who for thy table feeds the wanton fawn,
For him as kindly spreads the flow'ry lawn:
Is it for thee the lark ascends and sings?
Joy tunes his voice, joy elevates his wings,
Is it for thee the linnet pours his throat?
Loves of his own and raptures swell the note.
The bounding steed you pompously bestride,
Shares with his lord the pleasure and the pride.
Is thine alone the seed that strews the plain?
The birds of heav'n shall vindicate their grain.
Thine the full harvest of the golden year?
Part pays, and justly, the deserving steer:
The hog, that ploughs not, nor obeys thy call,
Lives on the labours of this lord of all.
Know, Nature's children all divide her care;
The fur that warms a monarch warmed a bear."

—*Pope.*

According to an irresistible amount of scientific evidence, not only is the universe and man governed by omnipotent energies, but what we, in our

extremely finite ideas of right and wrong, consider to be "justice" to man is quite a secondary matter (see section 35). A part of the explanation of this is, that we continually view things, not in themselves, nor in their most essential and greatest relations, but only in relation to our own little selves, as if the interests of man were more important than those of the universe. If we were gods, we should probably see that all things in the universe are just and right, even including fearful catastrophes and the pain and privation caused by them; but we are not gods, nor ever likely to be, and we have no choice but to suffer and constantly try to improve.

Considering the extreme insignificance of man in the cosmos, it would be excessively vain, and altogether unreasonable, to expect that the operation of the great powers of the universe should be suspended, and the government of this globe, with its winds and tides, its subterranean fires, the heat it receives from the sun, which produces storms, hurricanes, floods, blizzards, pestilences, etc., and its deficiency, which causes great mortality in winter, should be altered, simply because man lives here, and is subjected by terrestrial phenomena to pain and suffering:—

> "Shall burning Etna, if a sage requires,
> Forget to thunder, and recall her fires?"
> —*Pope.*

> "When the loose mountain trembles from on high,
> Shall gravitation cease, if you go by?"
> —*Ibid.*

In consequence of the false ideas we entertain of our own importance, we are apt to forget that we live here only on sufferance, as beggars of Nature, and that we cannot be unlimited choosers. The great cause of man's conceit is his incessantly recurring self-consciousness, uncontrolled by suitable knowledge; but extension of science will diminish this conceit. The smaller the mind and the man, the greater is often the self-conceit, and the more he behaves as if he was "the hub of the universe."

"How flattering to the pride of man to think that the stars in their courses watch over him, and typify, by their movements and aspects, the joys or the sorrows that await him. He, less in proportion to the universe than the all but invisible insects that feed in myriads on a summer's leaf, fondly imagines that eternal worlds were chiefly created to prognosticate his fate. How we should pity the arrogance of the worm that crawls at our feet, if we knew that it also desired to know the secrets of futurity, and imagined that meteors shot across the sky to warn it that a tom-tit was hovering near to gobble it up; that storms and earthquakes, the revolution of empires, or the fall of mighty monarchs, only happened to predict its birth, its progress, and its decay! Not a whit less presuming has man shown himself; not a whit less arrogant are the so-called 'sciences' of astrology, augury, necromancy, geomancy, palmistry, and divination of

every kind" (C. Mackay, "Extraordinary Popular Delusions," 1852, vol. i, p. 222). Even more conceited than this is the idea that "every hair of his head is numbered," and the unprovable assertions that man is only "a little lower than the angels"; and that he "will live for ever." With regard to the biblical statement that "man was created in the image of God," the explanation afforded by science and the principle of evolution is, that the brain of man has been gradually developed by the impressions made by Nature upon it, until his mind has largely become an image of the universe, and therefore of the omnipotent powers and laws which govern it. And a chief reason why man and his brain has been capable of receiving those impressions is, that the same great energies and influences which affect inanimate things affect him; like them he is influenced by his environments, by time, space, gravitation, motion, heat, light, electricity, chemical energy, etc., and the actions of those influences and powers occur in accordance with the same chief laws and principles in him as in them. If we were uninfluenced by those powers, we could not readily appreciate their influence upon inanimate bodies, nor much sympathise with other animals.

His extremely exaggerated notion of his own importance is intimately connected with the fact that numberless persons prefer that which is pleasant to that which is good and true; and this largely arises from the circumstance that they are so much occupied in obtaining a living that they have not time to determine what is true, meanwhile pleasant untruths are taught as truths, accepted and believed, evil mental habits are continued, and self-improvement postponed, and all this arises from circumstances over which they have but little control. Error is often much more easily understood than truth, and wisdom and good judgment require a long course of study and self-denial to obtain.

Throughout Nature, less important matters are compelled by the operations of natural laws to yield to greater ones; life of all kinds is ruthlessly sacrificed when more serious matters are at stake. The wholesale destruction of life and happiness by famines, pestilences, and great terrestrial phenomena, takes place utterly regardless of the sufferings and prayers of mankind. It is evident from this that the free operation of natural laws and the proper adjustment of terrestrial energy is of far greater importance than the preservation of human life or the prevention of human suffering. By a single earthquake in Lisbon about eighty thousand persons were killed, and multitudes injured, rendered homeless, and insane. During famines in India many millions of human beings have died in an entirely helpless state by the fearful process of starvation. A simple list of all the earthquakes, floods, and famines, which have occurred within historic time, would fill a volume. "In Japan, earthquakes occur at the rate of two a day" (*Nature*, vol. xxxiv, p. 456; vol. li, p. 540). The Lisbon earthquake of the year 1775 is said to have destroyed twenty millions sterling worth of property. The fearful eruption of Krakatoa has already been described (see p. 138). Similarly, various erroneous

"religious" beliefs which have afforded, and are still affording some degree of comfort and consolation to millions of persons unacquainted with science, are gradually being sacrificed to the resistless progress of knowledge, regardless of the mental pain thereby inflicted on devout persons.

41. Limitations of Human Powers.

It is very flattering to man to be told that he is "the lord of all creation"; that his faculties are infinite; that "all things were made for him, the sun to rule by day, and the moon and stars by night"; and that "the value of a human soul is infinite"; "Thou hast made him a little lower than the angels, Thou hast put all things under his feet" (Psalms, chap. viii), etc., etc.; but these statements have been shown to be without proper and sufficient evidence. Nevertheless, there was some justification for the statements being made, and that was because the great energies of Nature, acting through surrounding conditions upon men, compelled them to believe and assert them.

Knowledge of the limits of human powers is necessary to wisdom. All human actions are limited by natural energies, and men can no more directly resist their influence than the grains of sand on the seashore can resist the mighty roll of the ocean. All men do as they must, subject to a certain degree of freedom of thought and action; if they were perfectly free they would not be limited in action by natural powers; and if they had no freedom of thought or action they would become unconscious and die. So far from man being "the lord of all creation," he is very often unable to control his own little self; this is illustrated by the fact that a very large number of men die prematurely through being unable to properly take care of their health. The late Duke of Wellington is said to have died through eating too freely of venison (P. Hood, "Treatise on Gout," 1879, p. 386). It is well-known that but very few men or women can properly control their passions or desires. Every act of man's life is a proof of the narrow extent of his powers. All men are compelled to suffer punishment by natural reaction if they do wrong. Men, governed by omnipotent powers, are like clay in the hands of the potter; they are carried through life by necessity, not by their own unlimited choice; they are often unable to do right unless they are compelled by complaint or assisted by praise. A mountain could easily crush a mouse, but a mouse could not crush a mountain; and although the amounts of action and reaction between man and the universe are necessarily equal, the powers even of this little planet are incomparably greater than those of all living creatures, and could as easily extinguish all human life in an instant of time as a man could extinguish the flame of a candle.

Man's freedom of physical action is limited in a very great number of ways. He cannot escape from this earth, and consequently not from its

motions; he is compelled to travel with it through space at the rate of about 68,040 miles an hour by its orbital motion, and at about 17,583 miles an hour by the motion of the solar system through space (Sir J. Herschel, "Outlines of Astronomy," 1849, pp. 285, 587). He has very little, if any, power over any of the great terrestrial phenomena, such as storms, floods, etc.:—

> And "after all, the best thing one can do
> When it is raining, is to let it rain."
>
> —*Longfellow.*

If we take the weight of the earth as being equal to 6,000 million million million tons, its specific gravity as 5·5, the population of the earth as 1,200 millions, the average weight of a human being as 112 pounds, and his specific gravity as being equal to 1·0, the total weight or gravitative energy of all mankind to that of the earth is in a proportion of one to about 100 million millions, and its total volume as one to about 18 million millions. Man is therefore only a very minute fraction either as regards weight or volume in comparison with the earth, and his power of directly influencing the universe or even the earth by means of his weight or by his muscular power is inconceivably small. As action and reaction are equal, and the energies of Nature are so immensely great, man's direct power of resisting them is extremely minute; thus, when a man, whose weight is 112 lbs., makes a leap, say 6 feet in height, he only pushes the Earth in the opposite direction about a 1,666 million million millionth of an inch. He can only be the cause of greater effects by adapting Nature to act upon itself, such as by the employment of gunpowder, steam, etc.

We are creatures of circumstances and slaves of our environments, our bodies and minds are continually affected by slight and unavoidable influences, the effects of which our wills have but little power to prevent. Mere suggestion and imitation often produces large effects upon us; thus, "if, when three or four persons are sitting at a table and engaged in conversation, you, seemingly without design, take up the snuffers and slowly open them to the utmost and shut them several times, one or two will have to struggle against an imitative yawn" (H. Mayo, F.R.S., "The Philosophy of Living," 1838, p. 207). Similarly, "singing-birds, when brought up with another kind, learn their notes instead of practising those of their own species" (*ibid.*) in consequence of the influence of the new notes upon them; and children similarly habitually imitate older persons, and acquire their habits.

Man's physical actions, his state of health, and his social well-being, are limited in all directions, by external physical influences, by climate, surrounding soil, the weather, rivers, cliffs, morasses, absence of roads, etc. Natural barriers, such as mountains and seas, favour national enmity. "Wind and tide wait for no man!" During severe winters, and in cold

regions, a great many people are practically imprisoned in their homes, and similarly in the tropics during the greatest heat of the day. All men must either alter their habits of living when old age approaches or incur premature death. When a man becomes old he must cut off many of the pleasures of the table and frequently also those of society; his bones become more brittle, and his heart more feeble, and he cannot safely indulge in violent exertion. Notwithstanding that "self-preservation is the first law of Nature," all men are continually compelled by the influences within and around them, and frequently by their own desires and the ignorant persuasions of those about them, to commit indiscretions of diet which shorten their lives; each day's action also of the most careful man brings him a day nearer to death. One proof of the inability of the average man to take sufficient care of himself is that only a very small proportion of men live to such an age as suitable knowledge and discipline would enable them. No amount of medical aid is sufficient to keep persons alive who are unable to take proper care of themselves; and there is a saying that "a man is either a fool or his own physician by the age of fifty." Nearly all human powers are so limited by shortness of life, ignorance of mind, or feebleness of body, that no man can be a "general specialist."

All men are restricted in their bodily actions by the great laws of Nature. Every one of us is liable to a very great number and variety of accidents and diseases, greater than those of any other living thing. We can only feebly resist the influence of natural powers within and around us; the action of our heart is almost entirely beyond our direct control, and that of respiration we can only suspend during a very brief period of time; there is however an instance on record, though almost a solitary one, of a Colonel Townsend, who was able to voluntarily suspend the action of his heart, and had done so on several occasions, and once in the presence of competent medical men, until on a subsequent occasion he died (Maudsley, "Physiology of Mind," 1876, p. 341; G. Moore, "Power of the Soul over the Body," 1846, p. 276); Phul, Rajah of Puttiali, had a similar power (Brewer, "Dictionary of Miracles," 1884, p. 89). Nearly all our chief bodily functions are largely beyond our direct voluntary control. We are unable by an act of volition to directly influence digestion, the functions of the liver, kidneys, or intestines, the actions of absorption, assimilation, secretion, etc. We cannot usually avoid or prevent the occurrence of pain. Every one knows that when food has once got sufficiently far into his mouth he is compelled to swallow it.

We can do but little in life besides adapting ourselves to circumstances; we cannot largely resist natural powers or temptations, but only avoid them. The conditions of climate limit our very existence. Under the influence of food, air, and the heat and light of the sun, the entire population of the earth develop, decay, and are renewed every few years; if that heat and light, or that supply of food or air, were to cease, the whole of the physical, mental, and moral phenomena of man on this globe would

terminate. Even if any great change of heat received from the sun was to occur, the lives of the whole of the twelve hundred millions of human beings upon this earth would be extinguished like the flame of a candle. We live in an atmosphere composed of about one-fifth by volume of oxygen, diluted with four-fifths nitrogen; but we should all be killed if the relative proportions of those gases were largely changed; nitrogen alone would suffocate us, and undiluted oxygen is a "virulent poison, not only for animal, but for plants"; "the poisonous property of excessive oxygen is so clear, so marked, that it can no longer be open to doubt" (Paul Bert, "Smithsonian Reports," 1893, p. 529). All great events run their course largely regardless of man; each nation is compelled to rise to a zenith of power and then decline; no human power can stop its downward career. Man is—

> "Fixed like a planet on his peculiar spot,
> To draw nutrition, propagate, and rot."
>
> —*Pope.*

These facts alone show that the principles of science and the physical and chemical properties of substances lie at the very basis of man's existence and activity. That which is essentially dependent upon something for its entire existence cannot be more important than that upon which it depends; the essentially greater importance of man, or his mind, than that of the world, exists only in his own deceitful imagination, and the idea is a relic of the dark ages. It is usually the most ignorant or the most conceited man who over-estimates his abilities. The fact that man is the most complex and intelligent of animals does not make his soul "of infinite value."

The human faculties are in many cases very clumsy instruments, especially when unassisted by knowledge, or by scientific contrivances. Men were unable to track the pathless ocean until they discovered magnetic oxide of iron and its properties. There is scarcely a faculty man possesses which is not extremely limited in comparison with the powers and capabilities of inanimate Nature. The duration of his life is to that of the world he inhabits, practically as nothing is to infinity. His speed and endurance of locomotion are also very limited; the globe to which he is fixed by gravity moves in one hour through a distance greater than he could walk in twenty thousand hours. Practically, he is by circumstances almost rooted like a vegetable to the locality of his dwelling; comparatively few men have walked even one hundred miles from their homes. Nearly all man's physical powers are very contracted, unless aided by scientific inventions and inanimate forces. Without the aid of a balloon he is absolutely fixed to the surface of the earth, and even with its assistance he has never ascended higher than about seven miles; and the depth to which he can dive into the ocean does not much exceed one hundred feet. A steam-engine, a dynamo, or a clock can work without stopping during many months, but a man can only do so during a few hours.

Man cannot irrevocably determine what he shall do, where he shall go, or even what he shall think, nor effectually choose anything in opposition to the great powers of the universe; he is alive to-day, but for all that he knows he may be dead to-morrow. Like "the cat cannot give up mousing" (German proverb), so a man cannot cease moving. Whether willing or not, he is incessantly compelled to live on this globe in the presence of all its phenomena, to continually receive physical and mental impressions, to be deceived by appearances, and be influenced by an almost infinite number of agencies acting upon him, both from within and without, during the whole of his life from the cradle to the grave. To gradually develop from childhood to manhood, and then to gradually decline and die. To be an unit in one of a long series of generations of men undergoing a gradual development of their powers in an increasing evolution of civilisation, and be carried along in the stream of time towards the infinite future, and then disappear into the infinite past. By the laws of his nature, the body and mind of each man must be more or less engaged, either in aiding general progress or in moderating its speed, but he cannot alter the rate of progress, nor hurry on a millennium. All men also must help each other and share their burthens to a greater or less extent.

> "What would this man? Now upward will he soar,
> And little less than angel would be more;
> Now looking downwards, just as grieved appears
> To want the strength of bulls, the fur of bears."
>
> —*Pope.*

The internal structure of a man's body proves that he is formed largely upon the same general plan as that of all other vertebrate animals; but being the most complex of all living things he is subject to a greater variety and number of pains and pleasures than any other. The skull of a man and that of a horse are "composed of exactly the same number of bones, having the same general arrangement and relation to each other" (Flower). In nearly all his powers, except that of intellect, he is surpassed by one or other of the lower animals; his vital energy, having a greater variety of duties to perform, appears to be divided into a greater number of parts, so that there is a less amount in each. Even the duration of his life is less than that of many inferior living things; for instance, elephants, camels, swans, tortoises, parrots, ostriches, eagles, falcons, vultures; "the carp lives 200 years," the whale "300 or 400"; many kinds of trees—the cedar, yew, the Adansonia, the Wellingtonia gigantea, etc.—live more than a thousand years; and it has been stated that "the dragon-tree and the monkey-bread fruit tree live more than five thousand years." Some plants grow very much faster than any animals; according to M. A. Boscowitz, *Revue Germanique*, "in the botanical garden of Caracas there was a convolvulus which, in six months, attained a length of six thousand feet" (F. A. Pouchet, "The Universe," 13th edition, p. 381). A Lycoperdon gigantea will grow from the size of an invisible seed

to that of a gourd in a single night, and Lindley has calculated that it produces about ninety-six millions of cells each minute (*ibid.*, p. 310). Man's bodily strength is much less than that of a horse, ox, elephant, and many other animals. In swiftness of motion he is surpassed by the greyhound, deer, and a multitude of birds and fishes. He cannot move his ears like a horse or an ass, nor close his nostrils like a seal, nor shake his skin like a horse or a dog. His digestive powers are weaker than those of an ostrich or of a serpent, or caterpillar. Some caterpillars swallow three or four times their own weight of food daily (*ibid.*, p. 82); and in some parts of Africa "the termites take but a very short time to devour an entire wooden building; a staircase of fair size is eaten in a fortnight; tables, and chairs in much less" (*ibid.*, p. 133). In the acuteness of his senses of smelling, hearing, and vision, he is excelled by various insects and animals; ants have a more highly developed sense of smell (Lubbock, *Nature*, June 27th, 1895, p. 210); a dog also has a more acute power of scent, and an eagle is considered to possess much keener vision than a man; an eagle's eyes are nearly as large as those of an elephant. The chameleon can look in opposite directions at the same instant, the two eyes acting independently (*Nature*, October 29, 1896, p. 622); it is also "accustomed to allow one side to lie quite torpid in deep sleep, while the other is perfectly awake" (G. Moore, M.D., "Power of the Soul over the Body," 1846, p. 72); each of these feats a man is unable to perform. Men cannot, like the sea-squirt, reverse the circulation of blood through his heart (Clodd, "The Story of Creation," 1890, p. 114). He is compelled to feed himself by means of his mouth, but there are several kinds of animals, "all of which absorb their nourishment through the skin without having any intestinal canal" (Semper, "Animal Life," 1890, p. 49). Some fishes can change their colour in from two to three minutes (*ibid.*, p. 91), which is a feat quite beyond human power. In some flies the weight of the eyes is one-fourth of that of the entire body (F. A. Pouchet, "The Universe," 13th edition, p. 79):—

> "Why has not man a microscopic eye?
> For this plain reason, man is not a fly."
>
> —*Pope.*

Man is by no means the largest of animals; one of the largest known is the extinct Titanosaurus; it was 100 feet long and 30 feet high (Lubbock, "Beauties of Nature," 1897, p. 100); a fossil Dinosaur "about 130 feet in length" has been found near Laramie, U.S.A. (*Nature*, January 12, 1899, p. 253); some insects surpass men in relative strength, they can leap 200 times their own length, and drag 15 times their own weight. "There are animals which have eyes on their backs, ears in their legs, and sing through their sides" (Lubbock, "Beauties of Nature," 1897, p. 87). "The dragon fly has 25,000 eyes." Some animals can emit light as occasion requires. The entire surface of one kind of shark (Squalus fulgens) sometimes emits a greenish light. "In certain Annelidæ, every act of muscular contraction

produces a flash of light" (M. de Quatrefages; G. Moore, M.D., "Power of the Soul over the Body," 1846, p. 98). "Berries, seeds, and herbs, that are extremely noxious to man, agree with numerous birds and mammals—with goats for example, the meadow-saffron, to such an extent, that their milk can act as poison upon children" (*The Open Court*, No. 153, p. 2421); "the largest annelid, Eunice gigantea, has 250 stomachs." Man is totally unable to fly like a bird, or dive deep into the sea like a fish; and he has not the power of hybernation like the mole, nor the capacity to endure privation of food possessed by a great variety of animals. "A camel will travel 12 or 14 days without water" (Mulhall, "Progress of the World," 1880, p. 374). If a man's limbs are cut off, he cannot, like star fishes and sea-anemones, reproduce them. According to Le Gallois, certain lizards can live a long time without their heads, and appear then to die of starvation (Sir. B. Brodie, "Psychological Inquiries," 1855, p. 115). "A peculiar property of the salamander is, that when repeatedly deprived of an important portion of its body, that portion is as frequently renewed. An eye, for instance, may be extracted, and speedily a new and perfect one is found to have supplied its place" (Beeton's "Dictionary of Science," vol. ii, p. 704); "the worm, or the mollusc, seems capable of reproducing every part; the crab will reproduce its claws, but not its head or tail; the salamander will reproduce its leg. In human beings a muscle is said never to be reproduced; but this is not the case in the rare examples of supplementary fingers and toes, which have been known to grow again after amputation" (G. H. Lewes, "Physical Basis of Mind," 1877, p. 97). In affection for their offspring many animals are equal to man. His obedience and faithfulness are not greater than those of the dog. "Many individual animals, dogs, horses, elephants, parrots, are both morally and intellectually higher than thousands of men in the very centres of modern civilisation" (W. L. Lindsay, M.D., "Mind in the Lower Animals," 1879, vol. i, p. 15).

There are plenty of proofs that various living creatures possess powers which men do not, or possess the same powers in a very much greater degree; for instance, there are "Amphibia, Mollusca, and others—which are able to live for years without food," and the temperature of their bodies is not perceptibly higher than that of the surrounding medium (Semper, "Animal Life," 1890, pp. 41, 411). A cat can cause its hair to stand on end, but a man has no such ability. The reptile, Gecko, can run along a ceiling, back downwards, without falling. Insects are supposed to be able to perceive rays of ultra-violet light which men cannot see, and detect changes of electric state of the atmosphere. "Long before a ship is sighted from the coast of Tahiti, she is signalled by the simultaneous crowing of all the cocks on the island" (*ibid.* p. 153), thus the senses of the fowls appear to be more acute than those of the islanders. Numerous well-authenticated instances are known of dogs finding their way home over long distances by roads they have never travelled before, and which even a man could not without the aid of a magnet, or without making

many inquiries on the way; for instance, recently (October, 1895) a dog was lost at Klausenburg in Transylvania, and in three days after his master's arrival in Vienna by railway the dog found his way home in a very exhausted state. Even herrings are stated to possess a power of foretelling the weather superior to that possessed by the unaided senses of man. "They seldom leave the shore in Megavissey Bay if the storm is coming from the west to the north, for with these winds we always have smooth water; but if it be coming from any other points of the compass there will be a heavy ground sea thrown on or along the coast, and ere it comes they are off and away."—"I have known them on these occasions leave their haunts full ten hours before the violence of the storm reached their locality. These facts have been known to our fishermen full thirty years, and are acted upon every winter by them" (Mr. M. Dunn, Falmouth Polytechnic Society, 1895). A very full account of the mental powers of animals in health and disease is given by Dr. W. L. Lindsay, "Mind in the Lower Animals," 1879 (see also Dr. Bastian's book "The Brain as an Organ of the Mind," 1890).

The superiority of man to all other animals consists in the greater variety of his powers, and his greater intellect, especially the faculties of comparison and inference; and in the use of his intellect to increase general happiness; but even he cannot usually make important discoveries and inventions until they are nearly ripe in the minds of his contemporaries. Man can also live under a greater variety of conditions than any other animal because he is able by means of his intellect to adapt surrounding conditions to his needs, animals can usually live under a greater variety of conditions than plants for a similar reason; whilst no plants appear to grow below 100 fathoms depth in the ocean, there is a particular kind of crab, Ethusa granulata, which lives at a depth of from 500 to 700 fathoms (Sir Wyville Thomson).

Although man is wonderfully constituted, and his structure is excessively complex, more so than that of any other animal, he possesses no sense whatever for directly perceiving time, space, the motion of the earth in its orbit, the pressure of the atmosphere, the force of magnetism, or the ultra-violet rays of light. There are millions of immense globes in the universe which his eye is unable to perceive without the aid of a telescope, and tens of thousands of dark ones which he cannot see even with such assistance. It is stated by reliable astronomers that there are more meteorites in space than there are fishes in the ocean, yet of these countless myriads he can perceive only an extremely minute fraction. He is equally incapable of directly perceiving small things without the aid of a microscope, and even with such aid he is utterly unable to see the atoms, or even the molecules, of which solid substances are composed. If his eyes were as powerful as microscopes, he would see millions of microbes in the air immediately around him. He is quite as incapable of realising the amazing complexity of molecular phenomena in substances, and the extreme minuteness of molecules and atoms, as he is of the vastness of astronomical ones, and of infinite time and space.

Some persons think that man's nerves are more sensitive than any inanimate substance, but this is not correct; a suitable kind of galvanometer is much more sensitive than a nerve; and a sensitive flame responds to (or "hears") sounds which the human ear is quite unable to perceive. Numberless heavenly bodies which the eye of man has never seen have been detected by means of their accumulative effect upon a photographic plate; the telescope and microscope have disclosed new regions of knowledge which are altogether beyond the reach of man's senses; by the aid of a microphone the walking of a fly can be distinctly heard; the "radiomicrometer" has enabled him to detect the heat of a candle at a distance of more than one and a half miles; and by a "voltaic balance" the influence of 1 part of chlorine in 500,000 million parts of water has been observed. The human eye is unable to discern the difference between compound colours and simple ones which the spectroscope or an absorbent screen enables it to readily distinguish. Man's perception of touch is far less acute than those of the microphone. A fluorescent liquid and a photographic surface will detect vibrations of light which he cannot at all perceive, and the latter can record images more permanently than his brain. Electrometers and galvanometers can detect thousands of times smaller amounts of electricity and of electric current than he could perceive. A bolometer can render manifest a one-hundred-thousandth of a centigrade degree change of temperature, whilst he can hardly detect a difference of an entire degree. Whilst carbon and platinum can be raised to a temperature of several thousand Fahrenheit degrees, or chilled to the absolute zero of $-273°$ centigrade, a rise or fall of ten such degrees in his bodily temperature endangers his life; this strikingly shows the extremely limited conditions of his existence. A phonograph can retain impressions of sound during a longer period of time than a human brain. "The phonograph knows more than we do ourselves, for it will retain a perfectly mechanical memory of many things which we may forget, even though we have said them" (*The Open Court*, No. 42, p. 1032). "The logical machine" is less fallible than a man in drawing inferences (see section 44).

Man's mental powers are as limited as his senses. All men are ignorant, otherwise they would not require knowledge. Man's brain is so small that he is unable to remember even a millionth part of existing knowledge or of his own individual experiences, and his mental faculties are so feeble that he cannot imagine with exactitude either a million inches or a millionth part of an inch, a million grains or a millionth of a grain, a million seconds or a millionth of a second, and as all possible knowledge and its applications are practically infinite, it will take all mankind an immense period of time to discover and apply it. A man can hardly reckon a million, or even ten thousand, without making a mistake, nor can he conceive an adequate idea of a billion. A million miles is quite beyond his immediate perception. In dealing with large numbers or complex quantities, he is obliged to use various physical and mental devices, such as calculating machines, logarithms, algebra, and mathematical methods. He is quite

unable to directly survey his own consciousness or think intently of more than one abstruse idea at a time. An extremely minute circumstance is capable of disturbing and entirely diverting his train of thought. No man can continuously, for more than a very short period of time, pay attention to and trace the origins of his successive ideas. He cannot create or destroy even a particle of dust, nor form out of nothing even a single idea; he is completely unable to destroy a fact. Each man can only perceive a very minute proportion of the phenomena which occur within and around him. He is compelled to wade through error in his slow progress towards truth; he must wait for new knowledge, and he is unable by means of his will to sensibly alter the rate of civilisation. He is practically compelled to believe a great many ideas which are untrue, and through his compulsory ignorance he is further compelled to commit many "evil" acts and suffer many punishments. The velocity of transmission of impressions through his nerves, and consequently the speed of execution of his will, is extremely slow in comparison with that of an electric current along a copper wire. Everyone is aware that it requires an observable amount of time to think, and that it often requires much time and attention to receive and understand a new idea. Only few men can study profound subjects during more than three or four hours each day. All men, but in different degrees, can only readily perceive that which is manifest, thus gold was discovered thousands of years before oxygen; and the existence of millions of solid bodies was known hundreds of ages before that of the universal ether.

New knowledge has been said to be "the pursuit of fools." There are multitudes of novel questions which man, with his present limited amount of knowledge and feeble intellectual powers, is quite unable to answer, notwithstanding that the answers are implicitly contained in the knowledge he already possesses of the chief laws and principles of science. "The faculties of the human mind, even when aided by the wonderful powers of abbreviation conferred by analytical methods, are utterly unable to cope with the complications of any one real problem" (S. Jevons). "If a mathematical problem was selected by pure chance out of the whole variety which might be proposed, the probability is infinitely slight that a human mathematician could solve it" (*ibid*). "When only three bodies simultaneously attract each other the complication is so great that only approximate calculations are possible, and the complete solution of the comparatively simple astronomical problem has yet to be given" (J. P. Cooke, "The Credentials of Science," 1893, p. 151). "In Algebra, mathematicians have not yet been able, except in special cases, to obtain complete solutions of equations of higher degree than the fourth, and the ingenious methods which they employ with problems which give equations of a higher order, yield at best only partial solutions" (*ibid.*, p. 112). It is folly to expect every excellence in one man or one class of men; for instance, expert investigators, who push exactitude to its utmost limits in some particular subject, are not always the most comprehensive thinkers; they

accept and use the more original and broader thoughts of other men, and other men use their more exact results. "We perpetually find ourselves in the position of finite minds attempting infinite problems, and can we be sure that where we see contradiction, infinite intelligence might not discover perfect logical harmony?" (S. Jevons, "Principles of Science," vol. ii, p. 468). This is really the chief explanation of what we call "evil." "Genius and wisdom are not always united." Even Jesus Christ, who is asserted to be the "eternal Son of God," and "incapable of error," believed in delusions; for instance, witches and demons, a devil, a hell of eternal torment and a heaven of perpetual happiness; He spoke of the earth as if it was flat, and the most important of all the heavenly bodies; His knowledge and mental faculties, therefore, in these subjects were more limited than our own.

Man's mental advance is as slow as his locomotion—a sixth part of average human life is consumed in acquiring the merest rudiments of general knowledge. Whilst his reasoning power, when applied to actual and correctly stated experience, is truly his "great guide of life," it only renders manifest and clear that which is already contained in that experience; for when he draws an inference or conclusion, he usually only states explicitly in a new combination of words what is already implicitly included in the propositions, and if the inference contains more than this it is unwarranted; he can only reason from previous comparisons, and only compare previous ideas; his reasoning faculty, therefore, does not really create ideas, but only evolves them out of previous ones. Few men can reason correctly. Man's mental helplessness in the absence of knowledge may be compared to his physical incapacity in the absence of light. Whilst principles are often simple, their practical application is often difficult; nearly every practical problem in Nature, and especially moral and social ones, which he has to solve is so complex, and affected by so many conditions and circumstances, that there are usually many ways of going wrong and only one of going right in solving it, and his mental faculties are so feeble that he often selects a wrong explanation, and he is only able to advance a very small step at a time in the discovery of truth, because he is continually obliged to halt and repeat his experiences. Man is constantly deceived by his senses, by his fellowmen, by superficial appearances, and by being unable to reason correctly. Whilst all men are extremely fallible, they are largely unconscious of their mental defects. Persons who have selfish desires will often accept every form of error rather than truth.

Notwithstanding the so-called "creations" of poets, painters, and imaginative persons, man is totally unable to create anything, either matter, energy, or knowledge, out of nothing. He cannot create a grain of sand, a drop of water, a bubble of air, a fraction of heat, nor even an idea; he can, however, watch the process of their evolution and variation in certain cases. He can only discover and evolve knowledge out of previously existing knowledge by the aid of inference and research; and

even in his research he must obey the laws of Nature and the rules of mental action. He can only evolve really new ideas from new impressions, or by comparing, combining, subtracting, analysing, or permutating previous ideas, and drawing inferences. Man is equally powerless to destroy a truth; a truth is a truth for ever. In all these things he is a beggar of Nature, and "beggars cannot be choosers," except within law-restrained limits:—

> "One science only will one genius fit,
> So vast is art, so narrow human wit;
> Not only bounded to peculiar arts,
> But oft in those confined to single parts."
>
> —*Pope.*

Although in accordance with the law of universal causation, whatever is must be, and therefore nothing is essentially evil, man is compelled by the very limited scope of his intellectual powers to call things or actions good or evil, according as they happen to produce pleasure or pain. This limited ability of taking comprehensive views of natural phenomena gives rise to numerous variations in the meanings of terms, causes endless confusion in speaking and writing, produces a great variety of contradictory beliefs, which originate a multitude of personal conflicts, religious and other wars, etc., and prevent a too rapid rate of progress.

The freedom of his will has very narrow bounds; however powerfully he may resolve to keep one particular idea in his mental vision, his attention will usually, in less than a minute, wander away from it and be thinking of something else; similarly, however strongly he may determine to keep awake, he will, if all conditions are favourable, quickly fall asleep. He can usually only effect his object by indirect means; for instance, he can only fall asleep by placing himself in all the circumstances which promote sleep; this effect, therefore, is not produced by the will but by the action of natural influences and environments, etc. (see section 43), and agree with the great scientific principle that an effect cannot arise without a cause. Numerous actions which are possible in themselves are impossible to us now, but by extension of knowledge will become possible to us in the future.

Not only are man's physical actions, and those of sense and intellect, determined and limited by laws and conditions, but also his social, moral, and religious conduct, are equally restricted and determined by surrounding circumstances, by the epoch of his birth, the country in which he lives, the people by whom he is surrounded, etc.; thus in very ancient times men were savages; a modern Englishman reared amongst his kind becomes a Christian, a Persian reared in Persia becomes a Mahommedan, a Chinaman becomes a disciple of Confucius, etc.

The extreme feebleness and "imperfection" of man's mental powers and moral sentiments are conspicuously shown by the great number and frequency of human incapacities, mistakes, and errors; those of a single

household are often so serious and frequent as to worry men into their graves prematurely, and worry causes a number of persons to commit suicide. "There is a skeleton in every house." The daily newspapers are to a large extent occupied by accounts of atrocities, accidents, misfortunes, explosions, shipwrecks, loss of life by disasters, cases of murder, wounding, theft, fraud, bankruptcy, legal disputes, strikes, riots, fire, violence, drunkenness, reckless cycling, riding, and driving, drowning, family quarrels, cases in the police courts and at sessions, assizes, and in the chief law courts, and courts of appeal, nearly all arising out of the "imperfections" of mankind, and necessitating the construction, maintenance, and management of a large number of gaols, police stations, lunatic and poor-law asylums, hospitals, retreats, and the employment of whole armies of policemen, lawyers, doctors, nurses, warders, gaolers, etc. But few persons can receive painful news with equanimity, nor without their feelings overcoming their intellect, even when the news is of great value to them; and in some countries even now the bearers of "bad news" to a reigning monarch are put to death.

Whilst we are waiting for an increase of knowledge and ability, and of means of preserving life, millions of men and other animals are dying prematurely. Disease and pain appeal for help. Death will not wait. A single incursion of an epidemic carries away thousands, cholera its tens of thousands. By the operation of natural laws, millions of lives have been sacrificed through pestilences, plagues, and famines, in consequence largely of man's limited powers. What can be more painful to behold than a mother and father deprived of an entire family of five or six children in rapid succession by scarlatina or other contagious disease, and both the medical man and the parents utterly unable to save them? and this is no unusual occurrence. The "Black Death" in the years 1348-1351 is estimated to have killed 25 millions of persons in Europe alone, and more than 35 millions in Eastern countries; London alone lost over 100,000 (Beeton's "Dictionary of Science," vol. i, p. 296). The great plague of London in the years 1664-1665 carried off 68,596 persons (Haydn's "Dictionary of Dates," Art. Plague); 750,000 persons died of famine in the province of Orissa, India, in the year 1886 (*ibid.*, Art. Orissa, p. 544).

Even some of what are commonly viewed as the wonderful products of man's intellect are far more imperfect than they are usually considered to be; for instance, the most perfect kind of boiler and steam-engine wastes about eighty-seven per cent. of the energy contained in the coal, and yields only thirteen per cent. of it in the form of mechanical power at the belt. In a cable tramway, a further amount of about eighty per cent. of the mechanical power produced by the steam-engine is expended in merely moving the rope, so that of the original amount of the energy contained in the coal burned under the boiler, only about 2·6 per cent. is available for moving the cars. In the case of the electric light, the proportion of loss is still greater; out of one hundred units of energy contained in the coal, less than one unit is ultimately obtained in the form of light, the remaining

ninety-nine units being lost in one way and another during the process, eighty-seven at least being lost in the boiler and steam-engine; in the case of gas light the ultimate proportion of loss is about the same, but in this case, there is a large set-off in the pecuniary value of the "residuals." These examples are quite sufficient to show that even in some of the greatest achievements of man there remains very great room for improvement.

Natural energies cause all changes in accordance with law, and the physical and mental actions of men are no exceptions to this statement; they influence us in every way often without our knowing it, in the most trivial actions as well as in the weightier ones, and we yield to them thinking that our volition and not they have caused the effects; the human will, however, only liberates, not produces, the energy which has been taken into the body in the food and air. No man can entirely liberate his mind from the influence of imperfect civilisation; even Luther believed most firmly in the existence of devils and witches, and Jesus Christ entertained some very false ideas.

It has been remarked that, "If the results of science were only to crush us with a sense of our insignificance, and show us that the life of a man is a bubble in the gleam of a million millions of suns, then man's life is only an atom between the infinitudes of 'greatness and smallness,' or 'as an ever-vanishing presence between two eternities.' 'Science reveals to us those infinitudes, and shows us that we are practically helpless.' But even now we have not sunk so deep into the shadow of nothingness as science, if she ran alone, would lead us" (F. W. Farrar, Sermon at Liverpool, September 20, 1896; *The Christian World*, September 26, 1896). With reference to these remarks, it is worse than useless to be afraid of truth; all scientific statements respecting mankind, which are really consistent with all known facts or truths, are themselves true, and we are morally bound to accept and believe them whether they are agreeable or not, and whether they are consistent or not with unproved theological ideas. If man really is "sunk so deep into the shadow of nothingness as science would lead us," we should accept the fact, and acquire sufficient knowledge of great laws to enable us to explain it; the latter appears to be especially a duty of those who profess to explain "the ways of God to men." The limitations of every human power ought to make all men humble and reverent.

Science, however, repudiates the above depreciation, and shows us, not "that we are practically helpless," but how to help ourselves, and with all his limitations, man has received from science many powers. In the sense of his being determined in all his acts by the energies of Nature and the conditions within and around him, he directs civilisation and progress; he diffuses happiness; he makes and unmakes; he preserves life and he destroys it; he is both a physician and a butcher; he has power largely to preserve or destroy the lives of all plants and animals; he has exterminated whole races of them and of his fellow-men; he is the master of all living things; their guardian and their judge; he can enforce rights and redress

wrongs; he discovers and invents; he changes the forms of animate and inanimate things; he breeds new varieties of plants and animals; he replenishes the earth by his devices in agriculture and chemistry; he can (in the above-mentioned sense) indirectly influence even his own course in life, and thus so far determine and direct his own evolution; and he exercises a multitude of other powers of which these are only a very limited selection.

42. Human Life and Energy.

"I am a man, and nothing human is foreign to me."
—*Terence.*

The term "life" is a very relative one; in its most comprehensive sense it is motion or activity, including both invisible molecular as well as visible or molar motion; and as the molecules of all bodies, animate and inanimate, of solids, liquids, and gases, are in an incessant state of movement, all substances whatever, even the universal ether, are in that sense alive and full of energy. Movement, however, is not necessarily life; the heavenly bodies move but do not live; mineral tufa grows interstitially, but is not alive. According to the ordinary meaning of the term, life does not extend to crystalline substances which grow externally to definite forms, nor to metallic trees of copper, silver, tin, lead, etc., which grow to vegetable shapes, and in which the principle of differentiation operates as it does in vegetables and animals. All living things have a cellular structure (J. A. Thomson, "The Science of Life," 1899, p. 103). The material of a living animal is continually changing throughout, but the general form is persistent. "Life is the sum of the actions of organised beings" (Fletcher), and is composed of incessant, mechanical, thermal, chemical, and other kinds of action; there is no life, either of animals or vegetables, without continual transformations of energy. That which lives is distinguished from that which does not live by production, growth, and reproduction (Huxley, "Lay Sermons," p. 77). Life is not an entity, but a condition; the idea of life is an abstraction. Similar to the fact that the collective actions of his different organs constitute the life of a man, so do those of individuals form the life of a nation. "Life is the outcome of a perfectly organised society of individual cells" (M. Dorman, "From Matter to Mind," 1895, p. 68). There is no special "seat of life" in animals. The essential idea of animal life is continual growth and simultaneous decay in all parts of the organism. Every successive minute we are not only a minute older, but slightly different; we are all continually being "born again," minute by minute, and molecule by molecule. During the period of youth the human body and mind incessantly expand in every direction in form and alter in composition. In consequence of continual removal by interstitial decay, living animal tissues cannot be permanently stained

(G. H. Lewes, "Physical Basis of Mind," 1877, p. 57); but the hair can be dyed. Life appears to be most characterised by wear and decay; thus, whilst the states of sleep and rest are the chief periods of growth and repair, the vital energy is most active during the periods of greatest waste and decay. "Life is a shifting outcome of two opposing sets of changes —the constructive and the destructive" (M. Foster, *Nature*, October 22, 1896, p. 601). "As soon as a man is born, he begins to die."

Life and vitality differ more or less in their minor manifestations in every different animal and vegetable. Animal life is limited to living structures which manifest the property of consciousness or feeling, but even this definition is indistinct, because there are "sensitive plants" (the Mimosa sensitiva, the Dionœa muscipula, etc.), which exhibit a closely-allied property; there exists no strict line of demarcation between animals and vegetables, for instance, there are meat-eating plants, pitcher plants, animals with stomachs, and animals without them (see Semper's "Animal Life," 1890, p. 49). "Plants have no stomachs, and no digestion" (Dr. Schleiden, "Principles of Botany," 1849, p. 498). Aethalium septicum may be regarded as either animal or vegetable (Huxley, "Lay Sermons," pp. 128, 129). The simplest form of animal life is Amoeba, "an every-moving, clear jelly" (Bastian). Dionœa, Drosera, and Linaria, are susceptible to impressions, followed by actions much like those of animals (St. George Mivart, "On Truth," 1889, p. 427). Difference of sex exists in many plants as well as in animals. Even plants, in some rare cases, are not entirely without the power of locomotion, thus the fruit-stalks of the Linaria will move about over the surface of a rock or a wall until they come to a hollow in which to deposit their seed (*ibid.*, p. 333). The process of grafting also, which is so commonly performed upon plants, has been performed upon animals, and the tail of a rat has been transferred to the back of the rat, and has grown there (*ibid.*, p. 439).

Life is in all cases a species of motion. "If one plant or animal differs from another, it is because in the building-up process the determinations of molecular motion were different in the two cases; and the true fundamental ground of the difference must be sought for in the cause of the determinations of molecular motion" (Croll, "What determines Molecular Motion?" "The Fundamental Problems of Nature," *Philosophical Magazine*, July, 1872). The properties of animate things, and those of inanimate ones, largely merge into each other.

What we term "life" always requires an organism, and is never found without it; and in all but the very simplest living things, the organism is composed of different parts each performing a different function; but in the simplest all the parts perform imperfectly all functions. "Co-ordination of parts or organs is the very essence of life and the primary functions of all tissue" (Laycock, "Mind and Brain," 1869, vol. ii, p. 339). In the simplest animals there is no chemical digestion. The lowest sign of animal life is irritability, and this merges by insensible degrees into that more complex action, sensibility. The cells of the human blood are alive

(G. H. Lewes, "Physiology of Common Life," vol. i, 1859, p. 280). Those living things which possess nerve-substance possess animal powers. "There is reason for believing that living matter may exist, in a completely passive state, without any chemical change whatever, and may therefore maintain its own special properties for an indefinite time as is the case with mineral and all lifeless matter" (H. T. Brown, *Nature*, December 16, 1897, p. 150). Some seeds, found in Celtic tumuli, and after an interval perhaps of two thousand years, sown in Chiswick Gardens, germinated into plants; similar successful experiments have been made with seeds found in ancient Roman tombs (J. E. Taylor, "Sagacity and Morality of Plants," 1891, p. 113). It is well-known that certain living fishes may be frozen and again revivified by very gradual thawing. Snails (and amphibia enclosed in gypsum) have remained alive a year without food (Semper, "Animal Life," 1890, pp. 41, 411). The origin of terrestrial life must be included in the fact of ceaseless molecular motion of inorganic matter; it could hardly have been brought here upon a meteorite, because meteorites are subject to the extreme cold of space, and then to extreme heat produced by friction whilst rushing through the earth's atmosphere. The tendency of biological investigation and inference at present is towards the conclusion that life arises from the actions and reactions of a number of complex organic substances upon each other within a cell, no one of which substances alone can be truly considered to be alive (see J. A. Thomson's "Science of Life," 1899, p. 115).

In accordance with the great scientific truth of universal molecular motion, both man as an individual, and humanity in the total, is always in motion. Rest is only a state of decreased motion, whether it be in living or in dead matter; the molecules of all bodies are always moving. Unless a man is tired it is impossible for him to remain even moderately still; and even when asleep he is moving; rest after toil is delicious, and activity after rest is equally so. Humanity in the total is a seething mass of more or less conflicting units, all of which are continually acting and reacting upon each other; and similar remarks are true, so far as we know, of all the animate and inanimate bodies in Nature.

The essential properties of an animal are contained in a rudimentary state in a vegetable, and in a still more rudimentary state in inorganic substances. "There is hardly a virtue which has not its counterpart in the actions of the vegetable kingdom. As regards conduct, in this respect, there is small difference between the lower animals and plants" (J. E. Taylor, F.L.S., "Sagacity and Morality of Plants," 1891, p. 7). "The desire to found a family is as manifest among plants as among men" (*ibid.*, p. 15). The similitudes of vice are as great and competition and the struggle for existence are nearly as killing amongst plants as amongst animals:—"in equatorial parts, the bush-ropes strangle, the parasites bleed, and the epiphytes hang on for a living. Travellers have to hew their way through the dense, tough, selfish mass of vegetation, just as miners have to force a passage through the rock" (*ibid.*, p. 41). "We have a plant in

our gardens, a native of North America, than which none can be more destructive of animal life, the dogs' bane (apocynum androsœmifolium) which is generally conducive to the death of every fly that settles upon it. Allured by the honey on the nectary of the expanded blossom, the instant the trunk is protruded to feed on it, the filaments close, and catching the fly by the extremity of the proboscis, detains the poor prisoner writhing in protracted struggles till released by death, a death apparently occasioned by exhaustion alone; the filaments then relax, and the body falls to the ground. The plant will at times be dusky from the numbers of imprisoned wretches" ("Journal of a Naturalist," 1829). As we can, from a great variety and number of facts like the foregoing, trace the similitudes of social and antisocial qualities of men, downwards through the behaviour of the lower animals into the conduct of plants, and even into the selection of materials for growth by crystals, it is a long step towards tracing them through the properties of inanimate bodies to the molecular movements of the elementary substances and compounds of which living beings are composed;—this will I have no doubt be done much more fully in the future when additional facts have been discovered. Even Aristotle hypothetically attributed life and thought to a common cause, and science now enables us to infer that common cause to be molecular and atomic movement. Sensation includes motion;—"Man is only a conscious machine" (S. Laing, "Zoroastrianism," 1888, p. 193). Most men by the time they attain the age of sixty begin to realise, if they did not before, that they really are machines, that the machine requires to be frequently oiled and repaired lest it may break down, that it must not be run at too great a speed, that the actions of the human body and mind are really based upon scientific conditions which dare not be neglected, and that the advice,—"take no heed for the morrow," is not to be acted upon without some qualification.

Each part or organ of a living organism, similarly to the organism itself, has, to a different degree in different cases, what may be termed a life of its own. There are plenty of examples of the organs, or parts of organs, of a variety of insects, fishes, and of other animals, continuing to act after severance of them from the head or from the body; thus the human heart continues to beat during a short time immediately after its removal from the body of a decapitated criminal. "Science regards a tree as an aggregate of many individuals" (Dr. Schleiden, "Principles of Botany," 1849, p. 533).

In animals, vital functions are superadded to mechanical, physical, and chemical ones; we act not only mechanically, physically, chemically, and vitally, but all collectively (G. H. Lewes, "Physical Basis of Mind," 1877, p. 384). Every different living tissue has more or less a different property (*ibid.*, pp. 64, 68). Contractility is a vital property of muscular tissue, and sensibility of nerve-tissue. All the activities of a man are included in maintenance, development, reproduction, and decay. Nearly every total arrest of change is death to a living structure; our bodies and brains must

have continual variation of diet and occupation in order to sustain life. Every breath of air or beam of sunshine alters a man's physical and mental state; one day like a phœnix, the next day like its ashes; he is like a flower expanded and brightened by the solar rays during the day and contracted by night; he usually loses weight in winter and gains weight in summer; he begins life in the form of a jelly and ends it by becoming earthy and dry. Death is as necessary as life to all animate things; if men did not die, they would grow out of harmony with existing things, and become a curse to themselves and all around them;—"he liveth long who liveth well." The scientific motto of human existence is:—Life as it is, ever active and ever improving;—"The human mind is like a mill-stone; if you put wheat under it, it grinds the wheat into flour; if you put no wheat, it grinds on, but then 'tis itself it wears away." When a man has secured all his ambitions, and has no further real wants, he often begins to have imaginary ones, because he must be occupied. No two men's lives are exactly alike. Life is a conflict, and the only practical method is to fight through it. "Let him not boast who puts his armour on, as he who puts it off, the battle done" (Longfellow). Many of these who have failed in life were conceited and idle whilst young and neglected self-improvement. But we all do as we must:—

> "However we struggle, strive, and cry,
> From death there can be no escape,
> And no escape from life, alas!"
>
> —*Longfellow.*

It has been repeatedly asked, "Is life worth living?" and one writer boldly affirms that "man is a failure, the consummate failure of creation" (F. P. Cobbe, "Hopes of the Human Race," 1874, p. lxix); man, however, is no more a failure than any other living thing; the waste of life amongst the lower animals is much greater than amongst men. Human life is not entirely like a bed of rose-leaves, soft and fragrant; but whether it is worth living depends considerably upon the state of the largest of the viscera, viz., the liver; that it is really worth living is largely proved by the fact that nearly every person will fight for his life, and take nearly every means which he thinks will secure it; even those who complain most of the hardships of life, and say that "man is a failure," still struggle on; the proportion of human suicides is only a small one. The great struggle for existence is in all animals a result of the stimulus of instinct and of striving for the pacification of desire. An intelligent idea of "Life is not merely to live, but to live well" (Martial); and in doing so, all our faculties and desires may be gratified in moderation, but not in excess, and in some cases of gratification instinct is a safer guide than reason, but in others the reverse. Happiness of some kind or other is one of the chief objects of living, but whilst one man finds it in one set of circumstances, another man secures it in quite a different one; thus one man prefers fresh air, while another

prefers Fleet Street; this is very like the behaviour of plants; whilst some plants thrive in a soda soil, for instance, clovers; others, heather and foxglove, prefer sandstone to limestone; some grow in the light, some in the shade; some in cold climates, others in hot ones; some in marshes, others in dry deserts (J. E. Taylor, F.L.S., "Sagacity and Morality of Plants," 1891, p. 6). "Many plants appear to require a very precise diet, . . . whilst others seem to adapt themselves to all circumstances" (Dr. Schleiden, "Principles of Scientific Botany," 1849, p. 508). "Plants yield poisonous or inert secretions according to their locality" (*ibid.*, p. 508); thus, "the poisonous secretion of hemlock is not found in the plant of the Asiatic steppes" (*ibid.*, p. 30). Grouse thrive upon sandstone moors, but not upon limestone ones. Many human beings live like most plants, "from hand to mouth." It is our limited knowledge of the great truths of science which largely makes our ideas of life so vague and pessimistic. The chief object of life is not only how to live, but how to act so as to do the greatest good, and he who does so is better prepared to die. Life is usually less worth living to an old man than to a young one, because his term of usefulness is nearly ended. "Men may try many things, only do not live at random" (Göethe). The whole man to do one thing at a time (Chancellor Thurlow). "Life is an earnest business, and no man was ever made great by a diet of broad grins" (J. S. Blackie, "Self-Culture," 1889, p. 18). All men possess potential powers although they do not always exert them; discoverers, philosophers, thinkers, inventors, writers, singers, painters, musicians, etc., are so trained that they at once respond to the particular influences which excite them, but which have little or no such effect upon other persons, and most men find their happiness and desire to live in responding to those influences which most harmonise with their natural gifts or properties.

According to Hæckel, the stages which the human embryo and fœtus pass through during development are analogous to the following series of living organisations:—protoplasm, egg, morula, planula, gastrula, ascidian, amphioxus, low shark, amphibian, monotreme, marsupial, lemuroid, tailed monkey, tailless ape, Papuans (Anthropogie Lectures, xiv, xix). It was anticipated by Meckel in 1811, subsequently discovered by Von Baer, and now well-known to physiologists, that in the very earliest stages of existence the embryos of all animals are so much alike that they cannot be distinguished from each other. Structure and function are developed by action and reaction between the living substance or organism and its environments; thus, Hunter, by experiment, "so changed the environment of a sea-gull by keeping it in captivity that it could only secure a grain diet. The effect was to modify the stomach of the bird, normally adapted to a fish diet, until in time it came to resemble in structure the gizzard of an ordinary grain-feeder such as the pigeon. Holmgren reversed this experiment by feeding pigeons for a lengthened period on a meat diet, with the result that the gizzard became transformed into the carnivorous stomach" (H. Drummond, "Natural Law in the Spiritual World," 1888, p. 258).

It is by a gradual and complicated process, beginning in the mouth and ending in the blood and all the parts it supplies, that dead food becomes living human structure suited to its environments.

Life is a far greater mystery to the unscientific than to the scientific mind, because to the latter the whole of its phenomena indicate that they are entirely in agreement with known scientific laws. One theological writer states: "All life, I presume, even vegetable life is (so far as it goes), from the breath of God alone. There is no other, alternative, source of life" (R. C. Moberly, "Reason and Religion," 1896, p. 13); according to this highly materialistic statement, God has lungs and breathes! The essential characters of living things are like those of inanimate ones, viz., all are evolved out of previous things, all do as they must, and must submit to the consequences. According to another writer, life is proved to exist by its power of selection, but if this is correct, then crystals are alive, because they have the power of selecting from mixed substances in solution those alone which are necessary to build up their structures. It is not entirely correct to say that "a lifeless object makes no response to external impressions;" for instance, a piece of iron makes a response to a magnet, an unelectrified body responds to the influence of an electrified one, a "Crookes's mill" responds to light; a photographic surface responds to ultra-violet rays, etc. It has been conjectured both by Helmholtz and W. Thomson, that life may have come here upon a meteoric stone from some distant heavenly body. According to Dr. Lightfoot, a former Vice-Chancellor of Cambridge University, "man was created by the Trinity on the 23rd of October, 4004 B.C., at 9 o'clock in the morning"; but who now believes this very precise and unprovable assertion? According to science, man and human civilisation have been gradually evolved during a very long series of ages whilst this globe has been cooling.

Human vitality may be regarded as a form of energy, a kind of molecular motion, and, like the latter, it is subject to the laws of causation and continuity; one human life produces another, and so on through countless generations; each man has two parents, they had four, those had eight, they had sixteen, the next had thirty-two, and so on in geometrical progression, until, in thirty generations, the number of one's progenitors would amount to over 1,000 millions, or nearly the entire population of the earth; or, if viewed in the opposite order, *i.e.*, from parents to children, the principles of continuity of life and energy shown by the transmission of human characteristics are equally manifest. The blood of the earliest man has therefore been transmitted to all mankind; and the ancestry of every man exists backwards into the earliest periods. According to a calculation made by Sir J. Herschel: "The number of human beings living at the end of the hundredth generation, commencing from a single pair, doubling at each generation of thirty years, and allowing for each individual an average space of 4 feet in height and 1 foot square, would form a column having a base equal to the whole surface of the earth and sea spread out into a plane, and for its height 3,674 times the sun's distance from the earth"

(*The Fortnightly Review*, No. 1, May 15, 1865, p. 83). It would probably be attended by far greater suffering to mankind to be allowed to over-populate the earth, or to populate it too rapidly, than for the number of them to be checked or decreased by ignorance, disease, wars, pestilences, terrestrial calamities, etc., as they are at present.

> "What is the course of the life
> Of mortal men on the earth?
> Most men eddy about
> Here and there—eat and drink,
> Chatter, and love, and hate,
> Gather and squander, are raised
> Aloft, are hurled in the dust,
> Striving blindly, achieving
> Nothing, and then they die—
> Perish! and no one asks
> Who or what they have been,
> More than he asks what waves,
> In the moonlit solitudes wild
> Of the midmost ocean, have swelled,
> Foamed for a moment, and gone."
>
> —*W. S. Lilly*, "Ancient Religion and Modern Thought," 1885, p. 257.

> "As in a building
> Stone rests on stone, and, wanting the foundation,
> All would be wanting, so in human life
> Each action rests on the foregoing event,
> That made it possible. But is forgotten
> And buried in the earth."
>
> —*Longfellow.*

"All the vital and mental processes of organisms are prescient in their action" (Laycock, "Mind and Brain," 1869, vol. ii, p. 35). This is exemplified both in plants and animals; numerous illustrations are given in books on natural history of the power of particular animals and plants of anticipating or foretelling the kind of approaching weather; and the rudiments of a similar power appear even in inanimate substances; for instance, in the "chemical storm glass" and in the barometer, each of which indicates the advent of certain meteorological changes. The boy looks forward to become a man, the girl to be a woman.

All animal actions depend upon structure as well as upon other conditions. "Men's defects are more their misfortunes than their faults." A man's mental and bodily action at any given moment is a resultant of the whole of the influences acting upon his particular organism at that time. The primary basis of all human actions, whether physical or mental, is evidently the influence of substances upon our organs, either directly, or through the medium of the atmosphere or the ether; touch has been called "the mother of the senses." Similarly, all the organs of man act upon each other and are acted upon by external bodies, by contact or through the air, the nerves, or the ether. Foods, medicines, poisons, etc.,

act upon us by contact; alcohol, chloroform, act upon the brain, a dose of prussic acid causes instant death. The sounds of music, or of voices, transmitted through the air, or the sight of objects communicated through the ether, excites emotions, desires, and ideas; thus the sight of food excites hunger, that of suffering causes sympathy; and that of beautiful objects, etc., excites desires to possess them. The immediate causes of desire are largely the properties of substances and the cerebral impressions which they produce; hunger for possession has therefore largely a physical and chemical basis. In accordance with the principle of action and reaction, desires in their turn are the motives of human actions; even our religious emotions and ideas are largely caused by desire, thus the desire for eternal happiness gives rise to the ideas of immortality of the soul and of the existence of a heaven. The sight of the sculptured figure of a suffering Saviour excites "religious" emotions, especially in females. We can, in this way, trace even our so-called "spiritual" ideas to a material basis. "Our religious experience begins with the senses" (Max Müller, "Natural Religion," 1892, p. 195). Everything that is human is worthy of attention by mankind. It is a mistake to despise our animal natures or their material basis, as some hermits, monks, and ascetics have done; and it is an error to disparage our intellect as many religionists do, or to ignore our moral feelings and sentiments, as is the practice of libertines. That which we incorrectly call "base matter" is not only the vehicle of all energy, life, and mind, but it is the basis of our very existence, and we could not do without it for a single minute of time; we eat it, drink it, and incessantly breathe and consume it. It is no degradation to a man to be a machine, or to be composed of and be influenced by material substances; all men are machines, and there must be a foundation for every building; without the body there is no mind.

Increase of temperature appears to intensify the molecular motion of nearly all things, whether living or dead; the effects of solar heat upon plants and upon snow are very conspicuous. The heat of the sun, by raising the temperature of animals, increases the activity of their instincts, and the latter varies with the seasons, and affects the suitability of the flesh of wild fowl, fish, etc., for human eating. The experiments of M. Milne Edwards have proved that tadpoles undergo different transformations in the light, but not in the dark (Laycock, "Mind and Brain," 1869, vol. ii, p. 274); and we know that light has a very great effect upon nearly all kinds of plants; for instance, the sunflower turns its face towards the sun; and various flowers open in the morning and close in the evening.

The very essence of human freedom and voluntary development depends upon action and reaction of environment; we know that a thing cannot act directly upon itself, and that all its immediate action is upon things outside it; but although the human mind is unable to directly influence itself, it can influence other things to react upon it; thus, as a man cannot in a direct manner largely alter his own mental or physical state, or directly cure his own defects, he can take such remedies, or place himself

in such conditions, as he believes will act suitably upon him; and this is the essential method of self-improvement. Moderate action and reaction between different organs and parts of the body develops each; use strengthens muscle, and increased strength of muscle develops greater use of it; thought, if not in excess, produces greater strength of brain, and greater strength of brain leads to stronger thought. Similarly, additional improvements in cycles requires further improvements in roads, and further improvements in roads encourages greater use of cycles.

Each living thing takes care of itself by means of action and reaction; the physical and chemical actions occurring in the human body produce sensations, emotions, and desires; these produce involuntary actions and ideas, and the ideas cause voluntary actions to satisfy the longings. We take food, and by its contact with all our organs through the medium of the blood it strengthens them; we take an emetic, and by its contact with the stomach it causes sickness; we smell the odour of food, and straightway we desire to eat; and so on. Similarly with bodies which act upon us from a distance through the ether; thus, we see an object of aversion, and it at once causes us to avoid it. Just as desires excite corresponding ideas, so conversely, ideas or cerebral pictures of things excite our cravings to possess them; thus we think of fine scenery and we wish to travel, or of our friends and we want to see them; we think of everlasting happiness and it excites a desire to secure it. In all such cases the principle of action and reaction operates. The actions, however, in many of such cases are so complex, that unless we are familiar with the great forces and principles of science which govern them, we are unable to understand them; and we consequently attribute them to an imaginary "spirit" or "soul" residing in the body, and distinct from it. As long as the properties of man's organism and of his environments are what they are, their mutual reactions must remain. In accordance with the mechanical law of action and reaction, Nature acts upon man, and man reacts upon it, but as Nature is incomparably the strongest, its influence is immeasurably the greatest; men are moulded by Nature and can only effect great objects by first obeying great natural powers. As also all men are usually stronger than one man, the influence of society in moulding a man is greater than that of a man in moulding society, and we find but few great men in unintelligent communities.

One of the chief effects of bodily existence of all living things, whether plants or animals, appears to be continuance of the species; when successors are produced and their safety provided for, death of the parents becomes necessary and makes room for others. "It may be taken as an axiom in vegetable physiology, that *cæteris paribus*, no plant dies a natural death until it has ripened seeds" (H. L. Grindon, "Life, its Nature," p. 96); and the earlier the age of puberty in a plant or an animal, usually the shorter is the life (*ibid.*, p. 97). Animals of inferior organisation usually reach maturity the quickest; thus, under favourable conditions, generation succeeds generation of some kinds of microbes as often as

every twenty minutes. Some animals of the lowest order, the infusoria, an Euglena, for example, have no act of birth, but practically live for ever; they accrete and excrete, become larger, each one then spontaneously divides itself into two; and multiplying in this way, they continue the process an indefinitely long period of time; they may however be killed. "So far as we know, there is no natural limit to the existence of the Euglena, or of any other living germ" (Huxley, "Lay Sermons," p. 75). Even a crystal if broken in two in its saturated solution gradually grows to two crystals. "In the lowest organisms all parts are competent to perform all functions, and one and the same portion of protoplasm may successively take on the functions of a feeding, moving, or reproducing apparatus. In the highest, on the contrary, a great number of parts combine to perform each function, each part doing its allotted share of the work with great accuracy and efficiency, but being useless for any other purpose" (*ibid.*, p. 126). Such creatures as the polypes and infusoria are gelatinous, having the lowest degree of animal properties, and have little more than the colour and consistency of water (Maudsley, "Body and Will," p. 131).

The question has been asked:—"Why does man exist?" (A. J. Bell, "Why does Man Exist," 1890, p. 3); the answer is very simple, and is included in the vastly greater one, why does anything exist? it is manifestly because the operations of the energies of Nature, under the particular group of conditions, compel it, just in the same way that they cause every thing else to happen; there is therefore no special peculiarity in the process in his case.

> "Created half to rise, and half to fall;
> Great lord of all things, yet a prey to all;
> Sole judge of truth, in endless error hurled;
> The glory, jest, and riddle of the world."
>
> —*Pope.*

"Man doth not live by bread alone" (Deuteronomy, chapter viii; St. Matthew, chapter iv); we all eat earth and grass second-hand through the medium of edible animals and plants. The chief essential conditions of human existence are air, food, water, and clothing; in addition, heat and light, exercise, sleep, a dwelling, a variety of food and of physical and mental occupation. Dead food becomes living men.

Stated in chemical terms, man's body and brain are composed chiefly of water, compounds of carbon, hydrogen, and nitrogen, which form the tissues, and phosphate of lime in the bones. When we remember that all kinds of languages are evolved out of the few elementary sounds of the alphabet, and millions of chemical compounds are made out of about six dozen elementary substances, we need not be much surprised that the complex structure of man is formed out of a few inanimate ingredients. His entire organism includes about fourteen elementary substances, the chief of which are hydrogen, oxygen, carbon, nitrogen, calcium, phosphorus, sodium, magnesium, potassium, with iron, manganese, silicon,

fluorine, and other minute ingredients. Nearly the whole of these a man must either have or suffer disease, and a great majority of them he must have or die. In addition to these material substances he must have suitable surrounding physical and chemical conditions. If this globe contained no water, or its atmosphere too little or too much oxygen, he could not exist. If the earth received no heat from the sun, or if it received too much, he could not live upon it. He can physically exist only within a small range of bodily temperature, and either a rise or a fall of less than ten centigrade degrees is fatal to him; he can, however, live uninjured a short time in a heated oven. These circumstances are only a few out of a multitude necessary to his healthy existence; and it is evident that man's bodily health and even his very existence depends upon a large number of scientific conditions. Everyone knows that a very trivial circumstance often gives rise to a train of symptoms which terminate in death. "If the body goes, all goes; much depends upon the cook."

Every man's physical and mental state is affected by numerous simple conditions and by a practically infinite number of complex ones, and in accordance with the principle of permutation, the possible variations of conditions of human life are practically endless. Every person knows that an immense number of different words and sentences can be formed out of the twenty-six different letters of the alphabet, and when we consider the great number of organs and different parts of our bodies, and the large number of variations of each organ and part, it is not surprising that no two persons in the 1200 millions upon the globe are entirely alike. "As long as the animal nature predominates in man, climate and local conditions will exert their influence unrestrictedly and, as in the animal and vegetable worlds, produce the greatest multiplicity of structures" (Shaaffhausen: Büchner's "Man, Past, Present, and Future," 1872, p. 146), no two of which are completely alike.

Man is a complex collection of molar and molecular motions, immersed in an infinite ocean of ethereal vibrations. He is a small epitome of many things, a "multum in parvo," a microcosm, a little universe. He is, or may be, compared to a mechanical apparatus, a chemical one, a system of telegraphic conductors, a photographic register, a logical machine, etc.; but neither in the human nor in any other living structure does there appear to exist a real wheel and axle. The interior of the animal body is a kind of laboratory; both fowls and crabs can convert other salts of lime into the carbonate, with which to form their shells (See "Evolution of Sex," by Geddes and Thomson, 1889, p. 104). The more complex a substance or a structure is, the more numerous usually are its properties; and in accordance with this, a man is a feeble epitome of nearly all the natural powers. Even Hume said: "It is evident that all the sciences have a relation greater or less to human nature" ("Treatise on Human Nature"). The interior of a human body is much more complicated than that of a battleship, a great ocean-steamer, or a large cotton-mill. The chief characteristic of man is his complexity, out of which arises nobler pleasures,

more varied pains. "I am fearfully and wonderfully made" (Psalms, chapter cxxxix). "It has been calculated that one square millimetre of human blood contains five millions of corpuscles." Very few persons have at all an adequate idea of the very great degree of complexity of the human body; not only do the nerve-fibres to a greater or less extent, but also the blood-vessels, permeate nearly every part of the structure, so that if the bones, muscles, and all the other parts were taken away, and either the nerves or the blood-vessels alone were left in their proper relative positions, there would still exist the entire form of the body and of its organs. "The blood forms about $\frac{1}{12}$th part by weight of the entire body, and it is calculated that it may circulate completely in about $1\frac{1}{2}$ minutes" (J. Marshall, "The Human Body," 1882, p. 64); this equals a circulation of about one hundred pounds each hour. "It is difficult for us to realise the fact of this incessant torrent of confluent streams coursing through every part of our bodies, carrying fresh fuel to feed the mighty flame of life, and removing all the ashes which the flame has left." "If for the moment we could with the bodily eye see into the frame of man, as with the microscope we see into the transparent frames of some simpler animals, what a spectacle would be unveiled. Through one complex system of vessels we should see a leaping torrent of blood, carried into the depths and over the surfaces of all the organs with amazing rapidity, and carried from the depths and surfaces through another system of vessels, back again to the heart; yet in spite of the countless channels and the crowded complexity of the tissues, nowhere should we detect any confusion, nowhere any failure. Such a spectacle as this is unveiled to the mental eye alone, and we cannot contemplate it even in thought without a thrill" (G. H. Lewes, "Physiology of Common Life," 1859, vol. i, pp. 270, 271). Plants have no system of veins or arteries. "Nothing higher or more perfect than man has been produced by Nature" (Büchner); in other words, man is the most complex of all known living creatures.

As an example of the complexity, accuracy, and rapidity of action of the human brain, and the nervous and muscular system in certain cases, I quote a copied report of an address by Sir James Paget, F.R.S.:—"He remembered once hearing Mdlle. Janotha play a presto by Mendelssohn, and he counted the notes, and the time occupied. She played 5,595 notes in four minutes, three seconds. It seemed startling, but let them look at it in the fair amount of its wonder. Every one of those notes involved certain movements of a finger—at least two; and many of them involved an additional movement laterally, as well as those up and down. They also involved movements of the wrists, elbows, and arms, altogether probably not less than one movement for each note; therefore there were three distinct movements for each note. As there were twenty-four notes each second, the total was seventy-two movements in each second. Moreover, each of these notes was determined by the will to a chosen place, with a certain force, at a certain time, and with a certain duration. Therefore there were four distinct qualities in each of the seventy-two movements

in each second. Such were the transmissions outwards. And all these were conditional on consciousness of the position of each hand and each finger before it was moved, and, while moving it, of the sound of each note, and of the force of each touch. All the time the memory was remembering each note in its due time and place, and was exercised in the comparison of it with other notes that came before. So that it would be fair to say that there were no fewer than two hundred transmissions of nerve-force outwards and inwards every second, and during the whole of the time the judgment was being exercised as to whether the music was being played worse or better than before, and the mind was conscious of some of the emotions which some of the music was intended to express" (Quoted by J. Rickaby, "First Principles of Knowledge," 1896, pp. 364, 365).

The human body is largely a dual apparatus; thus we each possess two legs, two arms, two feet, two hands, two eyes, two ears, two nostrils, two lungs, two kidneys, two ovaries, two halves of cerebellum, and two of our brain proper, and of the spinal cord; and if in any case one of a pair is disabled, its duties are more or less perfectly performed by the other, and thus our life is maintained, though in a less perfect manner; the entire of one side of the body of a man may be paralysed, as in cases of hemiplegia, and life may be maintained during many years; and it is well-known to physiologists that one half of the cerebrum may be diseased, and very few symptoms shown of loss of intelligence or of power of directing muscular movement. The dual nature of each man is often shown by "lop-sidedness," probably caused by using one side of the body and brain more than the other. No man is perfectly symmetrical either in body or mind, the want of symmetry may often be seen in the face; few men can use their left hand as readily as the right one. Men have been known to live a long time with one useless lung. According to Dr. Wigan, the left half of the brain, which controls the right half of the body, is the strongest in all but left-handed persons. The two hemispheres of the cerebrum, or brain proper, are very similar in form and appearance to the two halves of a walnut, and are similarly united together near the base by a bundle or "commissure" of nerve fibres. The nerve structures of the chameleon is so very largely dual that the animal may be considered to a great extent as being two individuals in one. The phenomenon of dissymmetry, or right and left handedness, is exhibited not only by animals, but even by inanimate substances; for instance, by crystals of dextro and lævo-tartaric acid, and by some other chemical compounds.

All things, animate and inanimate, mineral, vegetable, and animal, are not only influenced in their actions by their environments, but each differently, according to its own properties and structure, and the ordinary behaviour of man is an instance of this great truth. Iron, but not glass, is attracted by a magnet. Even the difference of conduct of two species of dogs, such as a spaniel and a bull-dog, are quite conspicuous. The properties of a man also, both physical and mental, depend

largely upon those of the substances of which he is composed; thus, if there was no earthy matter in his bones, his body would sink down towards the ground like a jelly. There have been instances of this, and I have seen one in which a gentleman had to be strapped in his carriage, and his body flopped about like that of a fish by the motion of the vehicle. It is well-known that an excess of uric acid in the blood not only causes the joints to swell and become misshaped, but also influences the mental and moral actions of a man; that without a sufficiency of phosphorus in the brain a man cannot properly think; that an excess of common salt in the blood causes scurvy; that alcohol alters the properties and action of the brain; that if there is an excess of lime in the bones they are easily broken, and if there is a deficiency it produces "rickets" in children. It is similar with other animals; for instance, if a hen has not access to mortar, chalk, or lime in some form the shells of her eggs are very thin. Similar to all inanimate substances, man is only changed by an alteration of his internal or external conditions. Every little circumstance has an influence, and usually leaves an effect upon him, and thus by his conduct, speech, or avoidance of speech, his ideas, and the kind of company he keeps, are more or less disclosed; reticence is not always prudence, but frequently a hiding of ignorance or of some other defect.

Various minerals are occasionally found enclosed within others of a different nature; different crystals sometimes within each other; gases and liquids are found inside precious stones; different fruit trees may be grafted upon each other; accounts have also been published of an egg, with shell complete, having been found within another egg; and, according to Dr. Willich, even of a human female fœtus having been found within a newly-born female infant ("Longevity," 1799). All these exceptional instances can only be rationally explained by natural powers, environments, and circumstances, such as are used to explain ordinary ones. Siamese twins and human monstrosities belong to such a group of exceptions.

Much has been said about the absence of a missing link between man and the gorilla, but intervals or leaps of difference occur not only in anatomy and physiology, but also in other sciences; in chemistry, for instance, the atomic weights of the elementary substances are not an unbroken series, nor even one with differences of uniform magnitude, but with a number of breaks of various sizes in it. These abrupt changes of atomic weight are also attended by equally abrupt differences of property, from the colourless gas and lightest of all the known elements, hydrogen, with an atomic weight equal to 1, there is a leap to the gas helium, with an atomic weight 4, then to a white solid, highly oxidisable metal lithium, having an atomic weight of 7, from that to a very much less active metal beryllium, atomic weight 9; then to boron, a crystalline non-metal, atomic weight 11; and so on throughout the entire series of about seventy simple substances; and these abrupt changes of weight and property reappear in the molecular weights and properties of all their compounds, and must necessarily extend into all the magnitudes, configurations, and other pro-

perties of all the living and non-living structures into the composition of which the original elementary substances enter. According to Huxley, "the structural differences which separate man from the gorilla and the chimpanzee are not so great as those which separate the gorilla from the lower apes," and there is a jump from man to gorilla, from gorilla to orang, and from the orang to the gibbon (*ibid*). There are human beings existing now in Thibet closely allied to animals (see *Nature*, April 8, 1897, pp. 541, 542). A gap in a natural series does not prove absence of relationship or even a diminution of it, because it is itself a natural relation.

It is a very extensive truth that we cannot annihilate the essential qualities of bodies. Material substances carry various of their properties in different degrees with them into all the combinations and bodies into which they enter; and the more fundamental the property the more persistent is it and the greater is the degree to which it is inherited; thus the most essential property, mass or weight, enters with a substance, without any perceptible diminution, into every combination or body of which the substance forms a part; the less unalterable property, volume, similarly passes from the simple bodies to their compounds, but in a less perfect degree, and from its compounds into living structures, even into man; and similarly, but to a less and varying extent, the minor properties of the elementary and compound substances are conveyed by union into man.

The properties not only of man, but of all bodies, animate or inanimate, are in different degrees necessary results of those of the substances of which they are composed, though this is often not very apparent; "man is what he eats." We know, however, that the apparent is often different from the real (see section 39); and notwithstanding that the properties of common salt do not *appear* to be results of those of the sodium and chlorine of which it is composed, we know that they must be so because there are no other substances present to produce or possess them, and because the family likenesses of each of those two ingredients in the compound can be disclosed by means of chemical tests. As some of the apparent properties of those two substances are greatly altered when the two bodies combine, so, in a similar manner do those of food alter when the elements of it unite with our other constituents to form living muscle or brain. We know that inanimate substances, similarly to animate ones, but less in degree, become exhausted and require rest to recover themselves; thus an over-strained spring requires some time to regain its usual elasticity, and that if it is much over-strained it never entirely recovers; and as similar phenomena occur in all the organs of vegetables and animals it is reasonable to infer that the bodily and cerebral exhaustion of men is largely dependent upon this property of the substances and structures of which the human organism is composed. Properties indicate the nature of bodies; what a man does tells us what he is. Even a difference of sex is attended by difference of property; thus it has been said that "love is but an episode in the life of a man; it is the whole history of the life of a

woman" (Madame de Staël). It always was, and will be so, "man is fire, and woman is tow" (Longfellow).

There is no living organism composed entirely of solid, liquid, or gaseous substance alone; both vegetables and animals require in nearly all cases the three classes of substances. "Water is an indispensable condition of animal life" (Semper, "Animal Life," 1890, p. 140). Jelly-fishes consist of about ninety-nine per cent. of water (St. George Mivart, "On Truth," 1889, p. 322). Water constitutes about seventy per cent. of the entire human body, and about 78·4 per cent. of human blood; neither a muscle nor a nerve can act unless water is present in it; the entire human frame, except the enamel of the teeth, is more or less saturated with water. A perfectly dry human body contains about thirty-three per cent. of incombustible mineral substances. All the tissues and liquids in our bodies contain phosphate of lime and common salt, as anatomical constituents essential to our existence and health; the blood contains 0·4 per cent. of common salt, and is not perfect blood without it. A certain proportion of lime in the blood is considered necessary to the contraction of the human heart (S. Ringer, "Handbook of Therapeutics," 1885, p. 185). After perspiration, the surface of the human body tastes strongly of salt. Common salt is indispensable to animal life; wild animals resort to salt pools for it without molesting each other. "Ruminants are very fond of salt" (Semper, "Animal Life," 1890, p. 45). African children suck rock salt as English ones do sugar (W. Reade, "Martyrdom of Man," 1892, p. 285). Common salt costs little, but is worth much to all animals, partly because some saline substances promote the diffusion of liquids through animal tissues. Vitality, life, *i.e.*, continual growth and decay, could not exist without the co-operation of inanimate substances, and these substances are considered to be as much alive in the living body as the other constituents. Cats and dogs eat certain plants as medicines. That which is food to one animal is in some cases poisonous to another, for instance, rabbits can feed safely on belladonna and aconite, goats on hemlock and tobacco, pigeons can for a time live on opium (B. W Richardson), but each of these plants is poisonous to man; the white rhinoceros is poisoned by the plant Euphorbia candelabrium, whilst the black one can eat it without injury. Some animals can make bone with either magnesia, alumina, or strontia, instead of lime (G. H. Lewes, "Physical Basis of Mind," 1877, p. 61). Bees and some kinds of plants are influenced by anæsthetics. The fact that monstrosities of chickens can be caused by varnishing different parts of eggshells previous to incubation, proves that even the bodily shapes of animals depend upon scientific conditions; this subject is capable of much further investigation.

Environment "itself induces a plant to form definite variations in Nature" . . . "the origin of all plant structures issues from self-adaptation to the environment" (G. Henslow, "Origin of Plant Structure," 1895, p. 8). "Under new conditions the organism immediately begins to undergo

certain changes in structure fitting it for its new conditions" (H. Spencer, *ibid.*, p. 10). "The peculiarities of maritime and saline plants are in all cases caused by their environment" (Henslow, *ibid.*, p. 135). "Water induces all plants to vary alike" (*ibid.*, p. 178). "Plants that grow in localities marked by sudden extremes of heat and cold are always very variable in stature, habit, and foliage"; . . . "but thousands die" (Sir J. D. Hooker, *ibid.*, p. 26). Tempests stimulate vegetable life (Dr. Schleiden, "Principles of Scientific Botany," 1849, p. 456).

The dependence of life upon material conditions is observable in a multitude of ways; thus, the size of horses diminishes in northern latitudes, on islands, and on mountains (Varigny, "Experimental Evolution," 1892, p. 70). Anglers well know that small streams do not usually yield large specimens of fishes (*ibid.*, p. 79). Tadpoles, when fed upon the flesh of frogs, increase in the proportion of females from 54 up to 92 per cent.; and with bees, the sex, production of queens, workers, and drones, depend largely upon the kind and amount of food (*ibid.*, p. 107). Sex, both in plants and animals, depends largely upon external influences (*ibid.*, pp. 108, 109; see also Geddes and Thomson, "Evolution of Sex," 1889). The proportion of oil found in salmon when out of season and when in season, was found to vary from 1·25 to 18·53 per cent. (Varigny, *ibid.*, p. 117, Sir R. Christison). The proportions of carbonate of lime found in the bones of a man and of a woman of the same age were 9·98 and 4·52 respectively (*ibid.*, p. 121). There is more iron (and a greater proportion of red blood corpuscles) in the blood of a man than in that of a woman (*ibid.*, p. 122, Boussingault). Wild animals have usually heavier brains, but less flesh, than tame ones (*ibid.*, p. 166). Quails eat hellebore with safety, and so do oxen eat tobacco-leaves (*ibid.*, p 135). Belladonna poisons men, dogs, cats, and birds; but scarcely affects sheep. Larks and quails safely eat hemlock, until their flesh becomes poisonous to carnivora. Rabbits also eat with safety the red corn poppy (*ibid.*, p. 140). Aspergillus niger is poisoned by silver if it is grown in a silver cup (*ibid.*, p. 182). "Some fungi can grow in solutions of arsenic (A. Wilson, "Studies in Life and Sense," 1887, p. 325). Bean plants are killed by solutions of belladonna, nux vomica, prussic acid, and laurel water (M. Macaire). Culture alters the colours of beetroot, carrots, radishes, etc.; and suitable difference of environment causes gentians to be either blue or white. (Varigny, "Experimental Evolution," 1892, p. 53). Mignonette requires a rich soil to fully develop its odour, etc. (*ibid.*, p. 102). By means of culture and breeding, oxen have been rendered three times heavier than they were four or five centuries ago (*ibid.*, p. 166). Every breeder of animals and every horticulturist knows how to produce varieties by altering conditions and environments. "The sloth feeds on leaves, and scarcely ever drinks" (Waterton). The horse eats monk's hood; the goat, water-hemlock; whilst man is poisoned by either; a particular kind of caterpillar, the Orgyia antiqua, eats laurel-leaves; and slugs eat the very poisonous toadstool, Agaricus muscarius (Varigny, "Experimental

Evolution," 1892, p. 40). Weevils can swallow strychnine without being poisoned (W. A. Dixon, *Nature*, February 17, 1898, p. 365).

Man's body is largely a complex portion of differentiated earth; the whole of the elementary constituents of man's structure have come from the earth, the air, the water (partly through the vegetables and animals which form his food); and after he dies they return to the same sources, and subsequently pass, during long periods of time, through the bodies of numberless plants and living creatures, including that of man himself.

> " Hence, when a monarch or a mushroom dies,
> Awhile extinct the organic matter lies,
> But as a few short days or years resolve,
> Alchemic power the changing forms dissolve;
> Emerging matter from the grave returns,
> Fills new desires, with new sensation burns."
>
> —*Erasmus Darwin.*

> " Imperial Cæsar, dead and turn'd to clay,
> May stop a hole to keep the wind away.
> Oh! that that earth which kept the world in awe,
> Should patch a wall t'expel the winter's flaw."
>
> —*Shakespeare.*

In addition to this, the composition of a man's body is incessantly changing, new materials enter his structure, and worn-out ones pass away, the particles of which he is composed only belong to him temporarily; extra waste of tissue, within certain limits, being followed by extra repair. Large quantities of bones of soldiers killed at Waterloo and other battle-fields have been converted into manure, and used to extract phosphorus from them for the manufacture of matches; so that we not only indirectly eat our ancestors by converting their bones into wheat and then into bread, but we also burn parts of their bodies to obtain light. All men are, in some degree, indirectly cannibals. As these are well-verified, scientific facts, it is evident that the theological doctrine of a resurrection of the human body cannot be true, because the particles of substance composing one man belong to numerous other men, to plants, animals, and inanimate substances, as much as to himself. As also it is scientifically impossible to change one substance into another without at the same time changing its properties, the Roman Catholic doctrine that in the sacrament of the Lord's Supper, the bread and wine are converted into the real body and blood of Christ, without changing their properties, cannot be true; but whether the untruth is justifiable or not is a question of morality. There is no "missing rib" in man. "The child is father of the man" (Wordsworth).

> " Turn, turn my wheel! The human race,
> Of every tongue, of every place,
> Caucasian, Coptic, or Malay;

All who inhabit this great earth,
Whatever be their rank or worth,
Are kindred and allied by birth,
And made of the same clay."
—*Longfellow.*

Eighteen different elementary substances have been found in the composition of plants (Dr. Schleiden, "Principles of Scientific Botany," 1849, p. 3). The ashes of some plants are nearly wholly composed of silica (*ibid.*, p. 4). Plants live upon the carbonic acid and watery vapour of the atmosphere, upon the water of the soil, the ammonia and the mineral constituents of the earth dissolved in the water; and upon decomposed urea of manure; in the presence of chlorophyl they convert the inanimate carbonic acid, water, and ammonia, etc., by a process which is not yet fully known, into living protoplasm, but they are unable to convert the separate elementary constituents, viz., hydrogen, oxygen, nitrogen, and carbon, of these compounds directly into that substance. Protoplasm, the lowest form of animal substance, is a living jelly. All kinds of protoplasm consist substantially of hydrogen, oxygen, nitrogen, and carbon, with minute proportions of other dissolved substances. Animals derive their protoplasm from vegetables, they are unable to form it themselves, but why is not yet known. All animals are at first "masses of protoplasm with a nucleus" (Huxley, "Lay Sermons," pp. 126, 135). As the form of a crystal is largely modified by the presence of small amounts of foreign substances dissolved in the saline liquid from which the crystal is formed (see p. 55), so also to some extent the various forms of animal life to which protoplasm grows are probably influenced by the kind and amount of the minute ingredients in the protoplasm and its environment, and there appears to be considerable room for original experiment and investigation in this direction. The phenomena of disease, twins, and monstrosities occur not only in animals, but also in vegetables and in crystals; nearly every person has seen twin strawberries, and hazel-nuts with twin kernels. "Symmetry is to crystals what health is to animals" (Haüy). Lavalle cut off one corner of a growing crystal, the opposite corner then dissolved (G. H. Lewes, "Physical Basis of Mind," 1877, p. 97); if this is really a true observation it is well worthy of further experimental research.

Notwithstanding that scientific knowledge has been of such immense benefit to mankind as to be perceptible even to feeble intellects, some persons seem to think that "we are as far off as ever from understanding how the lowest germ of organic is generated from inorganic matter" (see Browning's "Message to his Time," by E. Berdoe, M.D., 1893, p. 34); but who can prove this assertion? or shall venture to set bounds to the effects producible by omnipotent energy acting through the brain of man during a long period of time. Whilst chemistry has not yet enabled us to construct, by synthesis, any living substance, it appears to be gradually approaching that stage of ability. It is not many years since chemists

were unable to construct a single organic product out of inorganic materials, but they are now able to build up various substances which were formerly only produced by means of living organisms; for instance, alcohol, tartaric acid, citric acid, urea, uric acid, alizarine, nicotine, indigo, peptone (?), various forms of sugar, etc., and hope to be able to form an albuminous compound in the lowest form of life as living protoplasm. All living things are composed of solids and liquids; there is very little life without water and air, and, as far as is yet known, all living things produce carbonic acid gas. "The present state of knowledge furnishes us with no link between the living and the non-living" (T. H. Huxley, Article on Biology, Encycl. Brit.); but, notwithstanding that the experiments made by Bastian, Tyndall, and others have not resulted in the production of living matter from dead materials, it by no means necessarily follows that future experiments will the whole of them fail; it is difficult, even now, to define where living ends and non-living begins.

As the very existence of man depends upon physical and chemical conditions, it necessarily follows that his physical and mental conduct also depend upon them. Thus, we find that the most intellectual and progressive nations are those who live in temperate or semi-hardy climates; that nations and tribes who live in extremely cold countries or in very hot ones are comparatively unscientific; that those who inhabit the torrid zone are indolent; that suitable climate and soil favour national progress; that those who live in inhospitable lands are unable to advance in civilisation; that the population of mountainous districts are usually more industrious than those who live in the plains; that they who live partly on animal food are usually stronger than those who subsist entirely upon vegetable diet; and it is well-known that the climate of the eastern states of America is very stimulating to the body and mind. "In America we see the effect of telluric influence in the modification of race very strikingly. The squat Irishman, the broad-shouldered Englishman, the bulky Hollander, as well as men of lighter build, all produce children of one type—of medium height, thin, of spare beard, and a certain subdued energy, with great endurance and a language expressive to exaggeration" (Fothergill, "Maintenance of Health," 1874, p. 373). The energy imparted by suitable climate largely enables the English and Americans to surpass other nations. The average duration of human life is stated to be greater in England than in France, Prussia, Austria, or Russia. Statistics have shown that the proportion of marriages fluctuates with the price of corn and rate of wages. Fine weather encourages rowdyism; common assaults are most frequent during the dog days, and burglaries during the winter. High wages conduce to drunkenness. We know also that temperance and abstemiousness in eating and drinking are great preservatives of life, and that multitudes of persons shorten their existence by neglecting the physical conditions of life. It has been said with regard to over-eating, "many men dig their graves with their teeth." We should "eat to live, not live to eat," because living is more important than eating. The evil effects of

over-eating are more injurious and less noticed than those of over-drinking, partly because solids pass less easily through the human body than liquids. "If a rich man wishes to be healthy, he must live like a poor one" (Sir R. Temple). Whilst men will sacrifice the lives of all other animals to preserve their own, they frequently do not restrain their own appetites to preserve their own lives; the influence of their environments is so great that they continue bad habits until it is too late and "death stares them in the face." Just as some persons have not the ability to safely use a razor, so others are unable to properly use wine, and therefore become teetotallers. The influence of natural causes upon the actions of men in complex cases is shown by the circumstance that the proportion of undirected letters which pass the London Post Office is about the same every year.

Every quality of a man has its own appropriate effect due to its kind; thus, the proper effect of goodness is affection; of wisdom, respect and success; of correct conduct, peace of mind; of good character, confidence; of genius, admiration; of truthfulness, belief; of honesty, trust; of eloquence, attention; of industry, wealth; of thrift, independence; of moderate desires, contentment; of temperance, good health; of patience and perseverance, attainment of object; of animal strength, endurance; of too great love of amusement, an empty mind; of idleness, loss of employment; of gluttony, rheumatism, gout; of drunkenness, crime; of waste, poverty; of avarice, diminished pleasure; of secrecy, mistrust; of suspicion, loss of friends; of excessive pleasure, pain; of constant excitement, insanity; of selfishness, remorse; of false ideas, irrationality and monomania; of ignorance, wrong conduct; of wrong conduct, failure; of incurable immorality, punishment, death. Bodily health requires bodily labour, mental health requires brain labour, and happiness requires useful labour. "Work is as much a necessity to a man as eating and sleeping" (Humboldt). A man who thinks much should sleep much. Live in earnest, but not too much so. "Keep yourself well in hand" (old Norse maxim).

A man is composed of a group or collection of organs and functions, some of which act automatically, whilst others require supervision and stimulation. He is like a collection of men with a director and commander, the brain, which can act directly upon those immediately beneath him, and compel them to carry out his commands; thus the brain says to the legs, go, and they goeth; to the hands, do, and they doeth; the intellect, says to the passions, be calm, and they gradually obey. In him, each of the organs is dependent upon all the others, and not one can live for itself alone, but must do its duty towards all and each, and the whole collectively, otherwise the man becomes diseased, and all the organs die; we cannot improve (or injure) one part of the organism alone without improving (or injuring) the whole. Similar remarks may be made respecting the human brain; none of its different parts can be too little or too much excited without injuring the others. Whilst there is no precise definition of disease (Dr. W. Hirsch, "Genius and Degeneration," 1897, p. 78), our

ailments are usually attributable to too great or too small a degree of activity of particular organs. "It is a general law that the vital processes of nutrition and secretion are not equally active in all parts of the system at the same time, and that activity of one part is compensated by an opposite state in another part" (Dr. J. A. Symonds, "Miscellanies," 1871, p. 191). The same is true of different parts of the human brain. The same energies and laws regulate disease as regulate health, and particular organs as well as the entire fabric; few men wear out equally in all their parts, and death usually results from the failure of the weakest; it is similar with all material structures, natural or artificial; for instance—

> "In building of chaises, I tell you what,
> There is always somewhere a weakest spot,
> Above or below, or within or without;
> And that's the reason, beyond a doubt,
> A chaise breaks down, but doesn't wear out."
>
> —*O. W. Holmes.*

Notwithstanding that scientific research is constantly proving that man is evolved out of inanimate substances, and that the vital energy within him can only be due to the energy contained in them, the statement has been made that "Biological science has failed, and must ever fail, to explain the vital forces as resultants from the physical and chemical ones" (J. J. Murphy, "Scientific Bases of Faith," 1873, p. 195). To say that science must ever fail to explain such a matter is a bold assertion; we know even now that our vital energy is chiefly, if not wholly, due to the food we eat, the air we breathe, and the exercise we take, but whether we can at present completely explain it is a secondary matter; ages are required to evolve some particular kinds of knowledge; we appear unable at present to completely explain anything. If we were able to explain everything, we would be gods, and would have no opportunity or pleasure of further improvement.

There are two sources of human energy:—First, the continual direct supply of heat from the sun; and second, the ceaseless molecular motion derived from the sun, and stored up in all edible substances and in human tissues, which enable chemical action, heat, and vital energy to be produced within them. A man's tissues are formed from his food; they are combustible, and all of them throughout his body are by means of the air he breathes continually being burned and supplying energy. Vital heat is as truly chemical heat as is the heat of a coal fire. "Oxygen is absolutely necessary for the evolution of nerve-force in all its forms" (Dr. W. H. Day, "Headaches," 1880, p. 24). "Every organ of the body, whatever its particular work may be, does it by virtue of the chemical changes in its cells" (M. Dorman, "From Matter to Mind," 1895, p. 124). It has been estimated that about six-sevenths of our completely assimilated food is used to produce bodily heat, and one-seventh to produce mechanical power. Nearly all human energy comes originally from the sun; the sun

shines upon plants, the plants store up its energy, men and other animals live upon plants, and the energy of animal flesh is conveyed, when eaten as meat, to man. Man's physical energy, or "man-power," is measurable in foot-pounds, and is expended in muscular action, in the voluntary acts of walking and other forms of exercise, in the involuntary ones of circulating the blood, etc., and in breathing; all the muscular and nervous actions being attended by oxidation and evolution of heat, which maintains the temperature of the body, and is continually being lost by radiation, etc. The daily work of the human heart alone has been estimated to be equal to "122 tons lifted one foot." From the quantity of combustible food consumed and work done, it has been calculated that the human structure is a much more economical producer of mechanical energy than the best steam-engine. It is well-known that in order to maintain the health and strength of the human organism, the quantity of food consumed and that of bodily rest, should be directly proportionate to the amount of bodily exercise, and the amount of food and sleep to that of mental labour. As age advances, the amount of solid food which can be digested decreases considerably, and the bodily strength diminishes. According to Dr. Lyon Playfair, the minimum quantity of solid food per week required to keep a man from starvation is three pounds of meat, one pound of fat, and two loaves of bread, with a little salt (W. Durham, "Food Physiology," 1891, p. 13). Lewis Cornaro, who died at the age of one hundred years, stated that he lived during the greater part of his life upon twelve ounces of solid and fourteen of liquid food per day. The stomach and lungs supply materials by means of the blood to the whole of the body.

All living things must have their appropriate nutriment, or die; even an egg cannot be hatched in nitrogen or carbonic acid gas, it must have oxygen. Thus the family of Hepaticoe grows chiefly on schists (Phipson, "Phosphorescence," 1870, p. 88). "Heathers refuse to take up their abode on limestone and chalk hills, and show just as much preference for the Mill-stone Grit formation as they do dislike for all kinds of calcareous rocks" (J. E. Taylor, F.L.S., "Sagacity and Morality of Plants," 1891, p. 163). "Thistles keep company with nettles and several other vegetable vagabonds, because they love to follow the same habits of life" (*ibid.*, p. 164); but more correctly because they are similarly influenced by the same kinds of foods and environments. "Birds of a feather flock together." Every moving thing, whether it be animate or inanimate, requires a supply of energy to keep it in motion, either direct, as in the wind moved by the heat of the sun, or indirect, such as that of the steam-engine, moved by the energy stored up in the fuel. The supply of energy to man is a more complex process than that to a plant, and still more so than that to a steam-engine; whilst that to man requires a continual change and variety of food, that to the steam-engine needs only a regular feeding with one kind of fuel.

That the properties and actions of external substances influence those of living bodies might be shown by a great variety and number of cases;

the following is a selected one:—"The most curious instance of a change of instinct is mentioned by Darwin. The bees carried over to Barbadoes and the Western Isles ceased to lay up honey after the first year, as they found it not useful to them. They found the weather so fine, and the materials for making honey so plentiful, that they quitted their grave, prudent, and mercantile character, became exceedingly profligate, and debauched, ate up their capital, resolved to work no more, and amused themselves by flying about the sugar-houses and stinging the blacks. The fact is, that by putting animals in different situations, you may change, and even reverse, any of their original properties" (S. Smith). A completely varnished egg cannot be hatched, because oxygen cannot enter it nor carbonic acid gas come out. Young observed that in the reproduction of tadpoles, whilst under the ordinary conditions, the numbers of male and female tadpoles were about equal, a highly nutritious diet was attended by the production of nearly all females. It has also been found that in the case of moths and butterflies, a starvation diet resulted in the production of males, and that with the ordinary plant-lice, a high temperature with plenty of food produced only females, whilst a low temperature and scarcity of food produced only males (H. Drummond, "The Ascent of Man," 1897, pp. 324, 325); somewhat similar phenomena have been observed with regard to the production of queen-bees; and have been recently affirmed to exist to some extent in human beings. Civilisation appears to be more favourable to the production of women than of men, as well as to their living longer than men.

Life is well-known to be prolonged by suitable change and variety; "six days shalt thou labour and do all thy work." In ancient times (and in savage communities now), there was much less variety of physical food and of mental impressions, men were less healthy in body and mind than they are in civilised nations now, and the average longevity of mankind has increased with the progress of civilisation. The benefit derived from attending places of worship is largely produced by change of impressions and by rest:—

> "If thou art worn and hard beset
> With sorrows, that thou wouldst forget,
> If thou wouldst read a lesson that will keep
> Thy heart from fainting and thy soul from sleep,
> Go to the woods and hills!"
>
> —*Longfellow.*

Equable and moderate activity of all the various organs tend to prolong life; he who lives the most irregularly and the fastest, usually dies the soonest; women live slower and longer than men; trees also live more slowly and longer than animals. Mushrooms grow quickly and die quickly. Health is "that state in which the body is not too consciously present to us; the state in which work is easy, and duty not over great a trial; the state in which it is a joy to see, to think, to feel, and to be" (Sir Andrew

Clarke); but very few persons, even amongst the most intelligent, when in a state of health, have sufficient self-command to "let well alone," and it is largely because they too readily "want a change."

The temperature of the human body is partly maintained by muscular and cerebral oxidation, by chemical changes occurring in the lungs by the oxidation of the impurities of the blood into carbonic acid gas, and by others taking place in all parts of the body. The normal temperature of man is about 99° Fahr.; and "a variation of eight degrees on either side is almost invariably fatal" (J. M. Fothergill, M.D.). Animal life is a consuming fire; throughout the structure of all animals, combustion incessantly proceeds, especially during the active waking state, but is largely diminished during hybernation and dreamless sleep; all parts of the body slowly burn into carbonic acid, water, and urea. Sensory impressions produce heat in the brain (G. H. Lewes, "Physical Basis of Mind," 1877, p. 360), and the head becomes hot by thinking. Every contraction of a muscle and every nerve action evolves heat and acid products; living vegetables oxidise, excrete, and waste during growth; similarly with animals, but to a much less degree. Living leaves accumulate carbon from carbonic acid in the air, and flowers oxidise carbon into that acid; the former accumulate energy, and the latter expend it (J. E. Taylor, "Morality of Plants," 1891, p. 14). About 225 pounds of carbon are burned to carbonic acid in a man's body in one year (Dr. Schleiden, "Principles of Scientific Botany," 1849, p. 471). Plants when blooming, evolve heat perceptibly ("Smithsonian Reports," 1893, p. 528). Germinating seeds develop heat freely, and evolve carbonic acid gas (Dr. Schleiden, "Principles of Scientific Botany," 1849, p. 539); this phenomenon is conspicuous in malting-houses. Trees are warmer in winter and cooler in summer than the atmosphere. The Siberian traveller, Atkinson, saw large poplars growing in a ravine with their trunks embedded in snow and ice to a depth of 25 feet, having a space round the stem, nine inches wide, filled with water, the only parts that appeared to be thawing (P. H. Gosse, "Romance of Natural History," p. 62). Similar to the burning of coal, "animal life is one of the outlets through which solar energy is dissipated" (Brooks Adams, "Law of Civilisation and Decay," 1898, p. ix).

We know that when two substances disunite, various of their properties disappear and others take their place. Similarly on the death of a man, the energy of his body and brain ceases and disappears, his individuality of appearance quickly declines, his body and brain decompose and decay, and gradually lose many of their properties and change slowly into dust. "For dust thou art, and unto dust shalt thou return" (Genesis; chapter iii). Whilst, however, these changes occur, the elementary substances of which his body was composed continue to exist.

That which grows continually decays, because vital action is chiefly an oxidising process Even the bones continually decay and renew (Dr. A. Combe, "Principles of Physiology," 1841, p. 195). The essential idea of a living vegetable or animal is that it is a self-feeding and self-repairing

mechanism. Even now, we speak of "the life of a steam-engine," meaning by that phrase, that the engine becomes worn out in so many years; but if in addition to its present powers, such an engine was so constructed as also to feed and repair itself, the phrase would be still more applicable. The "life of a locomotive" is considered to be "about fifteen years."

"And so from hour to hour, we ripe and ripe,
And then from hour to hour, we rot and rot."

—*Shakespeare.*

"Years following years steal something every day;
At last they steal us from ourselves away."

—*Pope.*

"Our life contains a thousand springs
And ends if one starts wrong,
Strange that a harp of a thousand strings
Should keep in tune so long."

—*Dr. I. Watts.*

"O thou who choosest for thy share
The world, and what the world calls fair,
Take all that it can give or lend,
But know that death is at the end!"

—*Longfellow.*

The intensity of life in plants and animals continually varies, and is greater and more complex during the waking than during the sleeping state; during dreamless sleep our life is more like that of plants, and we are nearer to death during winter than during summer. Hybernating animals are much nearer to death during their periods of hybernation; and plants approach in property that of inanimate bodies, and die in great numbers under the influence of cold; during the process of hybernation, the mole and other animals lose considerably in weight.

"As the barometer foretells the storm
While still the skies are clear, the weather warm,
So something in us, as old age draws near,
Betrays the pressure of the atmosphere.
The nimble mercury, ere we are aware,
Descends the elastic ladder of the air;
The tell-tale blood in artery and vein
Sinks from its higher level in the brain;
Whatever poet, orator, or sage
May say of it, old age is still old age.
It is the waning, not the crescent moon;
The dusk of evening, not the blaze of noon;
It is not strength, but weakness, not desire,
But its surcease; not the fierce heat of fire,
The burning and consuming element,
But that of ashes and of embers spent,
In which some living sparks we still discern,
Enough to warm, but not enough to burn."

—*Ibid.*

"Let him who knows not what old age is like
Have patience till it comes, and he will know it."
—*Ibid.*

Death is as necessary as life to all men, but the healthiest, if not the strongest, usually live the longest. "It is as natural to die as it is to be born" (Lord Bacon). According to Hirsch, insane families usually die out in about four generations ("Genius and Degeneration," 1897, p. 119). In the later part of life it takes all a man's wit to keep in health, the smallest changes greatly affect him, and the least deviation from the contracted conditions of living terminates his existence. The aches and pains of aged persons compel them to think much about themselves and thus to appear selfish. Life is only sacred whilst it is devoted to doing good, and when men cease to be useful they usually cease to be happy, and had better be dead. "Luther said, 'I am weary of life, if this can be called life. There is nothing which would give me pleasure; I am utterly weary. I pray that the Lord will come forthwith, and carry me home'" (Farrar, "Words of Faith and Wisdom," 2nd edition, p. 93). It is recorded of a niece of Dr. Franklin that at the age of ninety-eight in the act of death she was "gently touched by a friend," and murmured, "I was dying so beautifully when you brought me back! But never mind, my dear, I shall try it again." "What is death? It differeth from sleep but in duration" (Longfellow). "The sense of death is most in apprehension" (Shakespeare). Virtue diminishes the fear of death. "The free man thinks of nothing so little as of death, and his wisdom is a meditation not of death but of life" (Spinoza). The last words of Dr. Hunter were:—"If I had strength to hold a pen, I would write down how easy and pleasant a thing it is to die." Death is often called "a happy release."

"Our years are fleet,
And to the weary death is sweet."
—*Longfellow.*

"So Nature deals with us, and takes away
Our playthings one by one, and by the hand
Leads us to rest so gently, that we go,
Scarce knowing if we wished to go or stay,
Being too full of sleep to understand
How far the unknown transcends the what we know."
—*Ibid.*

"The grave, great teacher! to a level brings
Heroes and beggars, galley-slaves and kings."—(?)

In consequence of the greater variety of functions performed by the structure of man than by that of any other animal, each human physical faculty is often less developed by exercise in man, the total amount of energy is divided into a larger number of parts, and there is less in each; thus it is well-known that if a man becomes blind his senses of touch and

hearing become more acute, or if he loses a limb he acquires greater energy in the other parts of his body, the muscles of the heart having less work to do. This view also agrees with the fact that each faculty man possesses, except that of intellect, is excelled by that of some other animal who more constantly trains it; illustrations of this have already been given in section 41. No man can live both fast and long, partly because the amount of energy he possesses is wasted; this is illustrated by the fact that women in England live about ten per cent. longer than men, and have to pay that proportion more of money for an immediate annuity; and this is partly explicable on the view that their average daily expenditure of energy in proportion to their strength is much less than that of men. Many of those persons who pursue unexciting natural studies, such as botany, live long. The duration of life in animals is partly related to their degree of activity; thus, the tortoise is a most inactive animal and lives much longer than a man. It is well-known that excessive devotion to physical amusements tends to produce stupid old men. Excess of activity without judicious distribution or sufficient variety tends to shorten life; nearly every industrious intelligent man, however, usually expends as much physical and mental energy as his body and brain can bear. As the life of every man is only sufficiently long to attend to a few things, every man neglects many things. Dying men are easily persuaded, chiefly because they have little strength to resist, and because it matters but little to them what will happen after they are dead.

The functions of the human body have been conveniently classified into organic and animal, the organic being possessed both by vegetables and animals, and the others by animals only. "The organic actions consist of those by which the existence of the living being is maintained and the perpetuation of its species secured; the animal ones consist of those by which the being is rendered percipient, and capable of spontaneous motion. The organic processes comprehend those of nutrition, respiration, circulation, secretion, excretion, and reproduction; the animal ones include those of sensation and voluntary motion" (S. Smith, "Philosophy of Health," vol. i, p. 15). Both these classes of actions in animals are intimately related to the brain and other nerve-centres. "Those bodies in the base of the brain, termed the medulla oblongata, the cerebellum, etc., and the parts corresponding to these in other vertebrate animals, are connected with that class of phenomena which belong to the animal appetites and instincts; and the two larger masses, which are placed above them, the cerebral hemispheres, are more especially subservient to the higher faculties belonging to the intellect."—"In the lower class of vertebrate animals, in whom the appetites and instincts predominate over intellect, the first-mentioned bodies form almost the entire brain, and that very much as the intellect is more developed, so are the cerebral hemispheres more developed also; the degree of their development being more remarkable in man than in any other animal" (Sir B. Brodie, "Psychological Inquiries," p. 175). Many animals have

no cerebrum; and even infants have in some rare instances been born without brains. The "cerebellum belongs more especially to what Bichat has called 'organic life,' and furnishes the nervous force required for the action of the heart, respiration, digestion, and the other mere corporeal functions. It is also the part principally connected with the animal instincts and the emotions; but not exclusively so, as the other bodies, situated in the base of the brain, belong to the instincts and emotions also" (*ibid.*, p. 264). "The cerebrum or brain proper, is a congeries of organs, each having a peculiar structure" (*ibid.*, p. 111). All animals have two more or less symmetrical sides of a body, and have a brain divided into two parts to direct them; those possessing powerful sight have large optic lobes, and those of acute scent have large olfactory ones; large animals have usually heavy brains. The left hemisphere of the brain governs the movements of the limbs of the right side of the body, and the right one those of the left side. "Man's nerves are finer and more minute than those of apes." "There is no nervous system in plants" (Bastian); they grow to their shapes and dimensions more directly under the influence of the properties and molecular movements of the substances of which they are composed, and of their environments.

Eminent physiologists have compared the various nerve-centres of animals, and especially the cerebrum and cerebellum of man to a voltaic battery; and the nerves which lead from them to all parts of the body, to telegraph wires, and the comparison is very striking and to some extent appropriate. According to this view, the oxygen in the scarlet-coloured blood from the lungs acts chemically upon the grey nerve-matter of the brain, etc., and produces impulses which are transmitted outwards by the nerves. Numerous researches have shown that the nerves are of two kinds, viz., afferent, sensory, or centripetal ones, which convey sensory impulses inwards to the cerebrum and other nerve centres; and efferent, motor, or centrifugal ones, which transmit energy outwards from those centres to the numerous organs and muscles of the body, thus making the electric comparison much more perfect. A stimulant applied to the outer terminal of an afferent or sensory nerve determines a sensory current inwards to a nerve-centre; and the chemical excitation of a nerve-centre, either by means of a sensation or an idea, similarly produces a motor current outwards to a bodily organ or muscle; in this way a powerful stimulant applied to the distant extremities of an animal during sleep or immediately after death, produces, by what is termed reflex nervous action, an instant withdrawal of the limb. This power of reflex action, and of receiving and emitting nervous current impulses, is not limited to the brain, but is also possessed by smaller masses of nerve-substance, termed ganglions, existing in various parts of the body. Irritation of the stump of an amputated limb produces much the same feelings as if the limb remained, thus a man can feel as if his toes remained after his leg has been amputated. A nerve-current often increases in strength as it travels, much like a telegraphic one with a series of relays,

thus a feeble cerebral change may rise to violent passion, or during sleep to a terrifying dream. The rate of propagation of nerve influence along the nerves of a man is about 180 feet in a second (Maudsley, "Pathology of Mind," 1879, p. 492), and of a frog about "85 feet per second"; it also increases in speed as it approaches a muscle (G. H. Lewes, "Physical Basis of Mind," 1877, p. 182). "P. Ehrlich has discovered that in methylene-blue, which tinges blue the nerves of sensation, but on the contrary leaves untinged the nerves of motion, we possess an easy means of distinction for sensory and motory nerve terminations" (*The Open Court*, No. 153, p. 2420). The surfaces of the internal organs of man have usually less sensation than the external skin; according to medical writers, the human heart can bear to be touched without our feeling it. The spinal cord "receives all the nerves of sense, and gives forth all the nerves of motion" (Carpenter, "Mental Physiology," p. 23). "The contraction of the arteries are as much under the control of the nervous system as are those of the muscles of a limb" (Lord Lister, *Nature*, October 20, 1898, p. 607). As animals move from place to place, they require organs of sense and nerves of sensation in order to do so with safety; but vegetables, being fixed to the soil, have no nerves of sensation developed in them. When animals are asleep they are without perception like vegetables, and their nerves of sensation and of voluntary motion are much less excitable. According to Lewes, every nerve-change affects the whole organism as a wave ("Physical Basis of Mind," 1877, pp. 285, 359). Everyone knows that a dash of very cold water upon the face will cause a nervous feeling of chilliness to suddenly spread all over the body; and that even the mere thought of it has a similar but feebler effect, showing that the entire nervous system is apprehensive on the slightest premonition. The human body is, in a relative sense, outside the brain or nerve-centres, and during the process of education, the nerve-centres are stimulated by their environments which compel it to obey their influence. When we move our hand, a cerebral change occurs which we cannot directly perceive in any way; and the hand moves as if by some mysterious cause, but we know by means of experience and inference that the cause is a natural one.

All human actions, including both physical and mental ones, have been conventionally divided into automatic and voluntary; automatic, or those which spontaneously go on of themselves, and which may scarcely excite our notice; and voluntary, which always require our attention to stimulate and direct them. The two kinds, however, form the extremes of a series essentially the same, as is shown by their merging into each other through intermediate ones which are partly automatic and partly voluntary, such as the acts of breathing, walking, and "unconscious cerebration" (*ibid.*, pp. 195, 373, 376). Both the automatic and the voluntary actions, whether physical or mental, vary in degree of intensity directly in proportion to their exciting causes, from those which we can scarcely perceive to those of great energy; thus the automatic beating of the heart, usually unnoticed,

may be increased by inflammation or by great physical exertion to a violent and dangerous extent; that of the brain also, which usually goes on in the form of ordinary quiet thought without our scarcely perceiving it, may increase to raging madness by inflammation of the cerebral membranes in meningitis. Similarly the voluntary action of the legs, scarcely observed in slow walking, may be greatly increased by attention and volition; and that of the brain in ordinary unexciting thought may be increased by deep attention, or by the influence of great excitement. The acts of breathing, swallowing, coughing, hiccuping, sneezing, vomiting, and many others, are largely automatic. Mental influences similarly merge into physical ones through those of consciousness and feeling to those of reflex automatic actions of the viscera, secretion, and the muscles. The great centre of the automatic organic system of nerves (termed "the great sympathetic") lies in the abdomen, and it is well-known that whilst a blow on the head will make a man senseless without killing him, a violent one upon the pit of the stomach or the pugilist's "knock-out blow," near the heart, may kill him at once, because it suddenly suspends the action of the chief viscera (J. M. Fothergill, M.D., "Maintenance of Health," 1874, p. 15).

It is well-known that all the organic functions of our bodies, or those which are absolutely necessary to maintain life, go on of themselves without effort on our part, without exciting our consciousness or volition, and are only exhausted by excessive stimulation, by structural decay, or by death. Thus, our heart beats about sixty or seventy times a minute, or at a rate of a hundred thousand strokes every twenty-four hours, overcoming a great resistance at each stroke; our lungs expand about fifteen or eighteen times a minute, inspiring about thirty cubic inches of air each time, and the nerves and ganglions which regulate those organs operate, during the whole of our life, which may be eighty or a hundred years, without fatiguing us. "It is a fact that many, nay most, processes of our brain take place with the same automatism as the beating of our heart" (*The Open Court*, No. 53, p. 1179). But with all our conscious voluntary actions involving attention the case is largely different, they require frequent rest; thus the cerebrum requires about eight hours repose out of each twenty-four; also the more profound the thought and attention the greater the amount of rest required, and but few persons can study profound questions more than three or four hours at a time. According to Sir B. Brodie: "The muscles of the limbs may be for a long time in a state of involuntary contraction (as in cases of tetanus or catalepsy) without weariness being induced, but under the influence of the will they cannot remain contracted for more than a few minutes at a time" ("Psychological Inquiries," 1855, pp. 135, 136).

The capability of automatic action is not, however, strictly limited to the purely organic functions and the nerves and ganglions which regulate them, because it is well-known that by long-continued repetition, training, and education, various of our usually conscious and voluntary acts become

more or less automatic; for instance, those of walking, talking, repeating from memory, singing, playing a musical instrument, etc., acquire a degree of spontaneous action and momentum, and when once started go on largely of themselves. Many instances are recorded of soldiers marching, and persons riding on horseback whilst soundly asleep; musical geniuses perform, and elocutionists speak, often to a large extent automatically and with a correspondingly diminished amount of exhaustion. It is evident therefore that long-continued repetitions by making permanent series of impressions upon the usually conscious nerve-substance, enable the latter to regulate the same series of physical actions with less expenditure of attention and of cerebral energy. The influence of repetition and habit may be largely traced downwards through plants into inanimate substances:

> "Ill habits gather by unseen degrees,
> As brooks make rivers, rivers run to seas."
>
> "The bough that went, when green, awry,
> Will not come straight when old and dry."

Not only may voluntary actions become automatic by constant repetition, but automatic ones may become voluntary and capable of inhibition by persistent trial, and powers which we scarcely in any degree usually possess may be acquired and come under the dominion of voluntary action, for instance, that of moving our ears, and in rare cases contracting and expanding the iris of the eye, and even suspending for a short time the beating of the heart; this latter power was possessed by the eminent physiologist, E. F. Weber (G. H. Lewes, "Physiology of Common Life," vol. ii, p. 222), and by one or two other persons (see p. 186). Whilst in untrained men the simpler organs almost entirely govern the complex ones, and the men are largely machines; in educated and trained persons the latter more extensively govern the former.

Man has the power, by virtue of possessing the most complex brain, of performing a greater variety of actions than any other creature; he can within certain limits excite, increase, and sustain action, or he can prevent, obviate, hinder, or suppress it; thus, he can excite laughter, or he can suppress it; he can control his features, he can dissemble, etc., but few, if any, men, however, can perfectly command themselves at all times under all circumstances; and all these powers increase in a general way from birth to maturity. "A new-born child is, as Virchow has defined it, a mere spinal being" (T. Ribot, "Diseases of the Will," 1894, p. 3), *i.e.*, a mere automatic machine governed entirely by its spinal cord and reflex action, without the aid of consciousness; but consciousness, hunger, and desire, are subsequently developed, and intellect still later.

In accordance with the physical truth that contradictories cannot co-exist in any one thing, and that a substance cannot be hot and cold simultaneously, so two contrary diseases or ideas cannot co-exist, and one physiological action may inhibit or prevent another in the human organism;

thus, as the amount of blood in the body is a fixed quantity, when there is more blood and excitement in one part of the system there must be less in the other parts; similarly when attention is being paid to one subject it is not being paid to another, and thus one action or idea inhibits another. Strong emotion, such as fear and terror, inhibit nearly all other influences; great hunger and powerful desire of any kind act in a similar manner. The pain of a sudden burn will supersede that of the toothache. Strong desire expels the thought of punishment, and diminishes its effectiveness as a deterrent, hence the fear of being punished does not always deter men from committing murder. Whilst similar feelings and ideas strengthen, partly contradictory ones weaken each other, and every physical, nervous, or mental action inhibits and prevents its entirely contradictory ones. It is largely by the power of inhibition that the intellect controls and governs the instincts, emotions, and desires, and the nervous centres govern the muscles and automatic functions. Feeling tends to exclude reason, and reason to exclude feeling; many men are the slaves of their money and passions. "Cognition and emotion tend to exclude each other" (H. Spencer). The animal nature, desires, emotions, and feelings in men and women, are usually active in an inverse proportion to intelligence. Inhibition acts also in inanimate substances; for instance, zinc attached to copper diminishes its corrosion; various organic vapours also inhibit the oxidation of phosphorus. In accordance with the axiom that a mass or a molecule cannot be moving in two different directions or with two different velocities in the same direction at the same instant, so also no organ of a man can be fully active in two different ways or degrees at the same time, and this largely explains the incompatibility of some diseases. The greater impulsiveness of young persons than of old ones is due to the circumstances that the internal stimulus of the organism is relatively greater and the inhibiting power of knowledge and habit is less during youth than at later periods of life. Most men are like knives, they become sharper as they get older. The scientific principle of inhibition furnishes the essential basis of physical, mental, and moral training; *i.e.*, we excite the inhibitory power of the intellect by means of suitable environments.

As contradictories cannot co-exist in the same structure, good ideas and actions inhibit "evil" ones, and the converse. In many persons, animal passion, desire, emotion, and sentiment are often so strong that they inhibit the intellect, and as our environments frequently overcome our strongest resolutions, and an action cannot cause itself, we are unable to improve by any immediate and direct effort of will. In order to improve we have to employ indirect methods; thus, we inhibit the ideas we wish to avoid by thinking of others, we exclude "evil" actions by occupying our time with better ones, we avoid temptation by placing ourselves in other environments, and we then liberate our animal energy and enthusiasm to carry out our better objects. We quiet the passions of a child by immediately exciting its attention to something different. It is substantially in these ways that intellect acquires the control of blind animal feeling,

unhealthy emotion, and ignorant sentiment, and directs our physical energy so that it enforces the dictates of wisdom. It is by this scientific and natural process, and not by any occult or unintelligible one, nor by means of morbid nervous excitement or false ideas, that mankind are really "converted" and "saved."

Human life is largely composed of feelings and emotions, a perpetual coming and going of states of consciousness, a continual marching past of ideas and sensations; of feelings of sympathy with others and of different parts of our organism with each other, all occurring in the nerves and nervous centres. Sympathy is universal throughout all Nature, both animate and inanimate, the basis of that of the former being that of the latter, and both consist largely of harmony of molecular motion with that of ethereal vibration and radiation. Similar substances, structures, and organisms, in perfectly parallel states, are similarly affected by the same molecular and ethereal movements; thus, similarly tuned strings in two harps or pianos are similarly affected by the same sound from a third one; similar animals are usually affected by the same circumstances; thus, the whole of a flock of sheep are affected in nearly the same manner by the voice of their driver; similar animals live together in herds; "birds of a feather flock together"; similar substances, for instance the noble metals, are usually found together in the earth, etc. The sound of music, or the blowing of a huntsman's horn, not only excites men but horses, and old hunters have been known to join in the chase unaccompanied by their riders.

Sympathetic actions may be ranged in a graduated series without any great break between them, from those of the visible motions of ponderable substances to the most delicate and minute ones of the human brain, approximately in the following order:—the visible harmony of vibration of two pendulums causing each other to swing in unison whilst suspended near each other from the same support; a similar influence upon each other of two vibrating tuning forks or musical wires; the selective absorption of similar rays of light and heat by similar substances; the physical sympathy between all the different parts of a telegraphic system; the physical, chemical, and animal sympathy between all the different parts of the human nervous system; the similar influence of the sights and sounds of a theatrical performance, or of a religious ceremony, upon the nerves and minds of the whole of the audience, etc.

The brain and nerves of an excited person, like the molecules of a bell after it has been struck, require time for the molecular excitement and vibration to subside. On closing the eyes immediately after looking at the sun, the mental impression, idea, form, and light of the sun remain, but gradually fade away. Different animals, like different inanimate substances, are differently affected by the same vibrations; thus, some dogs howl at the sound of music; very interesting experiments of this kind have been made upon different animals in menageries (see p. 302). For the influence of music upon the cow, stags, mice, serpents, and spiders, see Dwight's *Journal of*

Music, October 26, 1861. Some persons are so misled by their feelings as to consider music "heavenly," or "the voices of angels" (see section 55).

Some nervous feelings and refined ideas blend with each other like the harmonious vibrations and sounds of musical instruments. Our automatic actions, mental and physical, blend with our conscious and intellectual ones in such an immense variety of ways as at present to largely exceed our powers of classifying them. There are many shades of nervous feeling which are so complex, so variable, and so fleeting that they are undefinable, and in consequence of those properties they have been looked upon by those who have a tendency to see the unexplainable in everything as mysterious and even as supernatural phenomena :—

> "There is a charm,
> A certain something in the atmosphere,
> That all men feel, and no man can describe."
> —*Longfellow.*

> "There was that nameless splendour everywhere,
> That wide exhilaration in the air,
> Which makes the passers in the city street
> Congratulate each other as they meet."
> —*Ibid.*

The nervous system, and especially the human brain, is often the seat of most peculiar phenomena. Many persons have seen much more beautiful sights, and heard indescribably more ravishing sounds, in their dreams than during their waking state, probably because the other parts of the brain are then less excited and allow more energy to be exerted in those devoted to sights and sounds. Many nervous persons who experience ill health observe sights and imagine ideas vividly in their dreams, and their visions and ideas persist so strongly into their waking state that they are unable to distinguish the dream impressions from the waking ones. Most persons have on some occasions experienced this in a less degree, and have remarked, "I must have dreamt it." Some of the finest language of poets and writers has been composed by them whilst their brains were thus locally active in a half-dreamy state.

It is well-known to physiologists that the nervous system, being extremely complex both in composition, structure, and function, is capable of exhibiting very varied phenomena, such as reverie, inspiration, hallucination, ecstasy, catalepsy, trance, simulation of death, visions, delusions, hypocondriasis, monomania, convulsions, frenzy, insanity, etc., etc., and that in many of these neurotic affections, and in nearly all the numerous cases of "miraculous vision" the phenomena have been due to highly excited or unhealthy states of the nervous systems of the persons who saw them. In the case of the vision of the Lady of "The Immaculate Conception" at Lourdes, in the year 1858, which has become so notorious, the only

person who saw the vision was Bernadetta Soubirous, a sickly child, fourteen years of age. After several repetitions of the vision, when the child came near the grotto where the vision occurred, "her face seemed to her companions as luminous and beautiful as that of an angel." On other occasions the spectators "all saw the supernatural change which came over the face of the child, but only the child saw the vision." "The crowd looked on in silence, every eye directed to the child, and all saw her transfigured. Her eyes glistening, her cheeks white and shining, she gazed fixedly at the vision, and sometimes a tear rolled down her face." All these symptoms indicate, not any "supernatural" or "miraculous" phenomenon, but a peculiar nervous state, the blood and energy retreating from the face to the brain. According to the statement of the child, she asked the vision her name, and the latter replied, "I am The Immaculate Conception." The dogma of The Immaculate Conception had been enunciated by Pope Pius IX only about three years previously (Dr. Brewer, "Dictionary of Miracles," 1884, pp. 484, 519. "From a pamphlet, 'Notre Dame de Lourdes,' sold on the spot.") All the phenomena of this case appear consistent with natural causes; it is well-known that unhealthy states of the nervous system are fruitful causes of visions, delusions, and superstitions, and it is hardly credible that any intelligent person could be so ignorant of physiology as to believe that the vision perceived by this sickly girl was really miraculous and supernatural. It is such credulity as this which largely leads to sectarian fanaticism and religious atrocities. As much money was expended by the numerous visitors to the spot, and a charge made as great as "sixty francs a night for a bedroom" (F. P. Cobbe, "Re-echoes," p. 142); and according to M. Zola, Lourdes sends 200,000 francs a year to the Pope (*Review of Reviews*, June, 1896, p. 407), the probable explanation is that the exhibition was used "for the good of the Church."

Many of the so-called "miracles" in which afflicted persons are cured or relieved of their complaints are natural effects of mental excitement and expectation, and as an expectation of cure predisposes the bodily organs towards it, faith is sometimes taken advantage of by physicians when prescribing bread pills instead of real medicines. When Sir H. Davy and Dr. Beddoes were making experiments with nitrous oxide gas they thought the gas might be used to cure palsy, and selected a case. Before administering the vapour they put a small thermometer under the tongue of a patient to ascertain the temperature; the patient, a man, wholly ignorant of the method, but deeply impressed by the physician of the certainty of the process, concluded that the thermometer was the remedy, and declared that he at once began to feel relieved throughout his whole body! In consequence of this, Davy did not administer the gas, but repeated the process with the thermometer alone, until at the end of a week the man was dismissed cured, the gas never having been used, and the cure being entirely effected by mental excitement and anticipation (A. Combe, M.D., "Principles of Physiology," 1841, p. 363). The question, How far are we

justified in deceiving persons in order to benefit them? belongs to the subject of morals.

To many persons it is not sufficiently known that frequent uncontrollable ideas, visions, sounds, and other sensations in great variety occur with some individuals in the entire absence of the corresponding realities. Such phenomena are usually produced either by thinking too much about the ideas or objects, or by local excitement of the brain, the latter being due either to some physical or chemical influence in the brain or by some influence conveyed to that organ by the nerves from other parts of the body, usually the stomach or other viscera. That these phenomena are not produced by external realities is proved by the fact that they occur when those are absent; for instance, the visions are seen with even greater vividness when the eyes are closed. A large number of such phenomena are recorded in Dr. Brewer's "Dictionary of Miracles," 1884. The dancing mania or epidemic "was a convulsion which in the most extraordinary manner infuriated the human frame, and excited the astonishment of contemporaries for more than two centuries, since which time it has never reappeared"; it commenced about the year 1374 (Hecker, "The Epidemics of the Middle Ages," 1871, p. 87).

What we usually term religious worship, adoration, natural awe, etc., consists largely of corresponding groups of nervous emotions or blended feelings and ideas, excited by the influence of environments and cerebral impressions; thus we feel the emotions of worship during religious services, of adoration when we think of a being of omnipotent power and goodness; of sublimity and awe when we are in the presence of great terrestrial phenomena, such as the Swiss mountains, the Falls of Niagara, or during violent storms of thunder and lightning; and that of beauty when we view magnificent scenery; and we realise the emotions of friendship, sympathy, and love, when we think of or see those who have suffered for us. In accordance with this, in nearly all forms of religion the nervous systems of the worshippers are acted upon, not only by statements which are provable and true, but also by some which cannot be true; and in the least intellectual forms of religion by purposely surrounding the worshippers with a combination of suitable physical environments (see section 56).

The phenomena of the human body and brain are largely influenced by "religious" excitement; the following is a well-known instance:—"Early in the eighteenth century the convulsionaries of St. Medard assembled in great numbers around the tomb of their favourite saint, St. Francis of Paris, in the churchyard of St. Medardus, and taught one another how to fall into convulsions. They believed that their saint would cure all their infirmities; and the number of hysterical and weak-minded persons of all descriptions that flocked to the tomb from far and near was so great as daily to block up the avenues leading to it. Working themselves up to a pitch of excitement, they went off one after the other into fits, while some of them, still in apparent possession of all their faculties, voluntarily exposed themselves to sufferings which on ordinary occasions would have

been sufficient to deprive them of life. The scenes that occurred were a scandal to civilisation and to religion—a strange mixture of obscenity, absurdity, and superstition. While some were praying on bended knees at the shrine of St. Francis of Paris, others were shrieking and making the most hideous noises. The women especially exerted themselves. On one side of the chapel there might be seen a score of them all in convulsions; while at another as many more, excited to a sort of frenzy, yielded themselves up to gross indecencies. Some of them took an insane delight in being beaten and trampled upon" (C. Mackay, "Extraordinary Popular Delusions," 1852, vol. i, p. 273); it is similar, though to a much less degree now, with some classes of religionists during "religious revivals," when they are told by their leaders that "the Holy Ghost" is amongst them. "The histories of great visionaries, were they correctly detailed, would probably prove how their delusions consisted of the ocular spectra of their brain and the accelerated sensations of their nerves" (I. Disraeli, "Miscellanies of Literature," 1840, p. 428). Swedenborg was at one time afflicted with seizures allied to epilepsy, saw visions, and had an attack of acute mania (Maudsley, "Natural Causes and Supernatural Seemings," 3rd edition, 1897, pp. 186, 226); George Fox, the founder of Quakerism, also heard voices and received revelations (*ibid.*, p. 187). One painter of portraits could so perfectly visualise his sitters by half-an-hour's steadfast gaze that he needed no second sitting; he, however, became subsequently insane (*ibid.*, p. 197). Ignatius Loyola, the founder of the Order of Jesuits, and St. Theresa, are well-known examples of nervous ecstasy, visions, and hallucinations, or so-called "spiritual" manifestations.

Our actions are results of our organisation and its environments. It is not our intellect which usually first prompts us to eat, drink, walk, sleep, etc., but our appetites, desires, and the states of our bodily organs; nearly all man's voluntary actions, his cultivation of science, religion, and theology arise in this manner. As long as men have living bodies, brains, and nerves, and the properties of these continue, they must have those motives. Men must desire food as long as their stomachs are pained by hunger or thirst, and their bodies experience discomfort by want. Some men suffer mental unrest until they discover a new truth or law; others until they can relieve distress. Nothing increases irrational desire and tends to produce monomania so much as continually thinking of its object. All these cases, and very many more, are explicable by scientific causation.

> "Two principles in human nature reign;
> Self-love to urge, and reason to restrain."
>
> —*Pope.*

> "Man, but for that no action could attend,
> And, but for this, were active to no end."
>
> —*Ibid.*

With all well-trained persons, reason is at the helm, whilst "passion is the gale." Instinct is an internal change often occurring without exciting

our consciousness. It is the blind guide and determining condition of ignorant persons; the lower the grade of human society the more are men governed and directed by emotion, sentiment, and personal craving. In the very lowest grade of animal life even instinct itself diminishes and finally disappears, and the forces which govern plants and inanimate bodies alone remain. "I call man's inability to moderate and control the emotional element in his nature *slavery*" (Spinoza). The "heart" is not more excellent than the head; nor are the emotions more noble than the intellect, because they both require to be controlled by it to prevent them leading men into "wickedness." The emotions, together with enthusiasm and the animal powers are, however, necessary means by which the dictates of reason are carried out; and even uncontrolled emotion is not always an unmitigated "evil."

All desire originates in a state of excitement, due to internal or external causes; it is a vital condition preceding voluntary action; a state of dissatisfaction which impels a person to remove it by means of gratification. It is the cause not only of our "evil" actions, but also of our good ones; it stimulates men not only to murder or make war upon each other, but also to seek knowledge and wisdom. It is a great moving influence in all men; but, as the huge ocean steamer needs to be directed by a rudder, so the brute forces and impetuous desires of all men require to be guided by comprehensive knowledge and intellect.

Life is largely a state of conflict; every step in the life of a man or of a nation is to some extent a social experiment, and the present state of each man, and of society in general is the result of a series of innumerable experiments. But few men would like to live their lives over again; and this is largely because they have a more vivid recollection of their pains than of their pleasures; the verdict pronounced upon it by nearly every dying man is—"all is vanity." Whilst the old man fails in trifles, the young one neglects important matters; the former forgets his spectacles, but the latter fails to take sufficient care of his character or to live within his income. "Youth is a blunder, manhood a struggle, and old age a regret" (I. Disraeli). The average truth is, that life is an alternation of pleasure and pain, success and failure, labour and repose, a total of greater happiness than unhappiness; and that upon the whole it is to nearly all men worth living. Happiness is not wholly dependent upon knowledge; if it were, the lives of uneducated persons would be hard indeed. Feeling and passion are as necessary to happiness as intellect and reason; there are no great deeds done without animal energy and enthusiasm. "If I wish to compose, write, pray, or preach well, I must be angry; then all the blood in my veins is stirred" (M. Luther). Happiness consists in pursuing as well as possessing; we are always "going to be" happy, but the powers of Nature usually prevent the realisation of too much joy:

> "There is some special providence takes care
> That none should be too happy in this world."
>
> —*Longfellow.*

Life is usually a more painful career than young persons anticipate, and this is illustrated by the truism—"when a man marries his troubles begin." Life, fortune, happiness, is "a game infinitely more complicated than chess. It is a game which has been played for untold ages, every man and woman of us being one of the two players in a game of his or her own. The chessboard is the world, the pieces are the phenomena of the universe, the rules of the game are what we call the laws of Nature. The player on the other side is hidden from us. We know that his play is always fair, just, and patient. But also we know to our cost that he never overlooks a mistake nor makes the smallest allowance for ignorance. To the man who plays well the highest stakes are paid, with that sort of overflowing generosity which with the strong delight in strength. And one who plays ill is checkmated—without haste, but also without remorse" (Huxley). "Life is not a bully who swaggers out into the open universe, upsetting the laws of energy in all directions, but rather a consummate strategist, who, sitting in his secret chamber over the wires, directs the movements of a great army" (Balfour Stewart, "The Conservation of Energy," 1873, pp. 161, 162):

"In battle or business, whatever the game—
In law, or in love, it is ever the same;
In the struggle for power or scramble for pelf,
Let this be your motto, 'Rely on yourself.'
For whether the game be a ribbon or throne
The victor is he who can go it alone."

—*Saxe.*

Happiness is not altogether absent from any man, each has his own kind of pleasure:

"The learned is happy to explore,
The fool is happy that he knows no more;
The rich is happy in the plenty giv'n,
The poor contents him with the care of heav'n.
See the blind beggar dance, the cripple sing,
The sot a hero, the lunatic a king;
The starving chemist in his golden views
Supremely blest, the poet in his muse."

—*Pope.*

"Behold the child, by Nature's kindly law,
Pleased with a rattle, tickled with a straw:
Some livelier plaything gives his youth delight,
A still louder, but as empty quite;
Scarfs, garters, gold, amuse his riper stage,
And beads and prayer-books are the toys of age;
Pleased with this bauble still, as that before;
Till tired he sleeps, and life's poor play is o'er."

—*Ibid.*

"Whether with reason, or with instinct blest,
Know, all enjoy that pow'r which suits them best."
—*Ibid.*

"Every worker who works till the evening, and earns before night his wage,
Be his work a furrow straight drawn, or the joy of a bettered age;
Every thinker who, standing aloof from the throng, finds a high delight
In striking with tongue or with pen a stroke for the triumph of right—
All these know that life is sweet; all these, with a consonant voice,
Read the legend of Time with a smile, and that which they read is 'Rejoice.'"
—*Sir Lewis Morris.*

Why are human beings so often unreasonably discontented with life? It is essentially because they are incessantly stimulated and compelled to desire change by internal and external stimulants acting upon them, because their experiences are oftentimes painful; and because few possess a sound, scientific philosophy to steady them. Whilst, on the one hand, when they have obtained one thing, and are then compelled to want another; on the other hand they are conservative and unwilling to alter lest the change may be unfavourable to them; and thus they hover between what they have and what they want, through the conflicting influences of fear and desire; unable through ignorance to discern the future, and afraid to venture until either increase of knowledge enables them, or increased strength of blind influences compels them, to decide. The object of life is not uselessly to complain, but to diffuse knowledge, and as fast as we can remove all just cause of complaint.

The following quotations partly show a theologian's view of human life:—"What is the peculiarity of our nature in contrast with the inferior animals around us? It is that though man cannot change what he is born with, he is a being of progress with relation to his perfection and characteristic good. Other beings are complete from their first existence in that line of excellence which is allotted to them" (Cardinal Newman, "A Grammar of Assent," 1870, p. 341); this statement does not appear to agree with what we know respecting the effects of training upon animals. "No science of life, applicable to the case of an individual, has been or can be written" (*ibid.*, p. 347); at present, no *complete* science can be so written, but as individuals are as much subject to natural powers and laws as the entire species, nearly all the essentials of the science of life applicable to each individual can be so written, much has been, and more will be in the future. "A man differs from a brute, not in rationality only, but in all that he is, even in those respects in which he is most like a brute, so that his whole self, his bones, limbs, make, life, reason, and moral feeling, immortality, and all that he is besides, is his real *differentia*, in contrast to a horse or a dog" (*ibid.*, pp. 274, 275); it should, however, be added that the differences are not of essential kind, but only of degree; the bony framework and the general mental structure of a man is built upon the same type as that of a dog; he therefore does not differ from a

brute in all that he is, but only in being a more complex and more intellectual creature.

A great deal of unphilosophic anxiety has been manifested, and many unscientific ideas and speculations have been published respecting what has been termed "human destiny." This phrase may indicate either the condition of all mankind at some remote future period of time termed "the millennium," when all men are supposed to be perfect, entirely happy, and living in peace with each other; or it may mean a supposed state of eternal reward or punishment during an imaginary condition of immortal existence after death. With regard to a millennium, it may be remarked that, in the widest scientific sense, human perfection is not a state of uniformity or stagnation, but a never-ceasing one of progress, in which every man has to continually readapt himself to changed circumstances; thus he may be said to be perfectly adapted to his conditions and surroundings one minute, but not the next, and therefore practically perfect now and at all times in relation to his internal states and environments, and his "destiny" is an incessant state of progress during life, not an unchanging monotonous millennium. A state of complete uniformity would be one of unconsciousness, practically one of death. His "destiny" as an individual is to die, his vital and mental condition then to cease, his body to disintegrate and decay; and no exception to these statements has ever been proved amongst the millions of millions who have died; it is evidently also his destiny while he is alive to obey all the energies that govern him, and under their power and guidance to work out his future improvement, to suffer pain and enjoy pleasure; to be carried along in the endless stream of time through immeasurable space, and in a multitude of other ways to do as he is compelled. We know very little respecting his condition in the far distant future, except that he will possess vastly more knowledge, morality, and peace of mind. Even scientific men cannot be reasonably expected to be able to reliably predict the exact condition of mankind ten thousand years hence as they can that of the heavenly bodies, because the data in the former case are so very much more complex, abstruse, and imperfect than in the latter one. And with regard to his supposed "destiny" after death, the manifest duty of those who believe in it is first to prove his immortal existence instead of assuming it, because the assumption is inconsistent with scientific truths.

Anxiety to know the ultimate destiny of mankind in an infinitely distant period of time is largely useless, because the knowledge at present is unattainable; it shows a deficiency of confidence in the omnipotent powers which govern the universe, and in a personal God, and is like many of the desires of unscientific persons, who, having failed to secure an average degree of happiness in this life, are dissatisfied and are in a state of anxiety respecting the future. Why need a man fear or be anxious about his "destiny" if his life has been reasonably virtuous and wise, devoted to doing the greatest good? why expect to reap where he has not sown? All that any man needs to fear is to do wrong. Many unscientific persons

wish to have profound problems solved for them without incurring the cost or personal trouble of properly investigating them; but such questions cannot be answered, nor reliable predictions made, without proper and sufficient knowledge, and this may or may not at present exist. Ignorance of fundamental science puts a man "out of court" in nearly all such profoundly scientific questions.

It has been said that "the great Enigma of Human Destiny, which has baffled so many noble understandings, is apparently not intended to be wholly or satisfactorily solved on earth" (W. R. Greg, "Enigmas of Life," 1889, p. 135). "Carlyle and Göethe, Bacon and Rousseau, attained no nearer to the golden secret than Job or Solomon, Anaxagoras or Plato. Generation after generation still sends forth new speculators"—"to confess to the same utter and disheartening defeat" (*ibid.*, pp. 135, 136); of "statesmen, philosophers, warriors, and poets—men of action and men of thought"—"who have sought to comprehend humanity," that "precisely in proportion as their experience was profound, as their insight was piercing, as their investigations were sincere, as their contemplations were patient and continuous, did they recognise the mighty vastness of the problem, its awful significance, and the inadequacy of the human faculties to deal with it" (*ibid.*, p. 117). I may however remark, that profound experience, piercing intellect, sincere investigation, and patient continuous contemplation, do not enable men to solve great enigmas or vast and mighty problems, unless they possess the necessary fundamental scientific knowledge upon which to base their inferences. Knowledge of the future is gradually being evolved by science, that of the heavenly bodies has been to some extent disclosed, and that of man, the most complex of all bodies, is following in its turn though a very long period of time behind. The present generation has attained truer views of man's nature, position, and destiny, and is therefore much nearer to the so-called "golden secret" than the ancients were. It is no disgrace to finite minds not to be able to completely solve vast and mighty problems if the necessary knowledge does not exist, nor if it is really beyond their powers; we cannot reasonably expect to make bricks without clay nor a mouse to move a mountain; the problem is one which requires for its complete solution more knowledge than we at present possess, and which can only be solved very gradually during a long period of time; man can only go on evolving in the future as he has in the past; and the idea of human destiny in the form of a millennium is evidently an *ignis fatuus*, because conflict is necessary to life.

It is further said—"Finally, we must conclude that the problem of man's wherefore, whence, and whither, was meant to be insoluble" (*ibid.*, p. 207); problems, however, which were formerly considered "insoluble" have in many instances become soluble by the progress of intelligence, and this one may become so, but it requires infinite time in which to discover infinite knowledge. And it is still further stated that "centuries have added scarcely one new fact to the materials on which reason has to

work"; "we possess scarcely a single item of knowledge of human nature which was not as familiar to Plato and to Job as to ourselves" (*ibid.*, p. 208). With regard to these extreme statements, we may be sure that Plato and Job knew very few of the hundreds of thousands of physical, chemical, anatomical, physiological, and psychological facts which are now known to affect human beings and consequently their future condition, and with respect to the great scientific principles which are now well-known, and profoundly affect the destiny of mankind, such as that of human evolution, gravitation, universal molecular motion, the universal ether, universal energy, universal radiation, the conservation and equivalence of matter and energy, etc., neither Plato nor Job were acquainted with more than some unproved guesses respecting a few of them, or they would have been handed down to us in their writings. We know that Lucretius, about 58 B.C., had an atomic theory of the universe such as we have now, and that Heraclitus, about 550 B.C., had an hypothesis of universal motion; but each of these views, which have now become settled truths, were then only unproved guesses and speculations.

A very important consideration relating to this profound question is, that a perfect system of energies, principles, and laws, such as the universe is now known to be, must necessarily contain in itself implicitly or potentially, and capable of being extracted when we know and apply the proper methods, answers to all possible rational questions respecting the things and actions in it, and to yield a gradually more precise reply to the question of "human destiny." In all such great and profound questions we may with advantage remember the words of Hippocrates, "life is short, art is long, the occasion fleeting, experience fallacious, and judgment difficult"; and that if we want knowledge in advance of the time we must either work or wait for it. It is a common human defect to wish to obtain valuable possessions without labour. There's no finality to man's endeavour; his work is over? no, never, never, whilst life exists.

The question has been asked—Why is there no creature more complex, more perfect than man? It is evident that the degree of complexity and perfection of man are limited by his structure, his environments, and by the stage of civilisation; in former times man was less perfect than he is now, his brain has become more complex with regard to the variety of his impressions and ideas by the extension of knowledge, and will become more so and man generally "more perfect" by a continuation of the same process in the future, *i.e.*, by incessantly trying to improve and do the greatest good, and herein lies the hope of greater happiness and a future heaven in this life for those who "fear the law and obey its commandments."

43. Consciousness.

That which we most wonder at we usually least understand; the nature and essential state of consciousness are still great mysteries to many

persons, but similarly as with other recondite phenomena, they become more understood as science advances. Largely owing to gradation of phenomena by insensible degrees into each other, those which happen to belong to the border-ground of contiguous complex sciences, such as physiology and psychology, are often difficult to make clear; this is the case with consciousness. Consciousness is "the perception of what passes in one's own mind" (Worcester's Dictionary); it is not an entity, but a phenomenon, an active condition of grey nervous substance; it is partly perception by the grey matter of the nervous system, of impulses arriving through the ingoing nerves; it has been said to be synonymous with mental existence, and this is largely true because it is the immediate fundamental basis of ordinary mental action. "Consciousness or feeling must be a phenomenon having a natural origin, or else it must be a non-natural, non-material entity"; but for reasons which have been set forth in various parts of his book the author (H. C. Bastian) "adopts the former of these views" ("The Brain as an Organ of Mind," 1890, p. 688). Consciousness is an accompaniment of nervous process (Ribot, "Diseases of the Will," 1894). "Consciousness is a knowledge of what is now and here present to the mind" (Sir W. Hamilton, "Notes on Reid," p. 810). According to G. H. Lewes, consciousness merges through sub-consciousness into unconsciousness, the kind of action being the same in each case ("The Physical Basis of Mind," 1877, pp. 195, 373, 376); this agrees with the phenomena termed "unconscious cerebration." Consciousness may be reasonably regarded as an effect of the molecular movements of the environments upon those of the nervous substance, and the greater the nervous activity thereby excited the greater the degree of consciousness; that which has no motion has no motive power, and "that which has no active power cannot impress our senses" (J. Bayma, "Molecular Mechanics," 1866, p. 11). We are conscious of a something either because we see, hear, smell, taste, or feel some kind of movement. Consciousness is manifestly due to impulses conveyed from external and internal sources to the sensory ganglia. It is attended by chemical oxidation, production of heat, and by increased growth and waste of the grey nervous substance; and may be regarded as consisting essentially of molecular movements in the nerve-cells, because it only exists whilst sufficient variation of impression is made upon them, and whilst they are in a suitable physical and chemical state to be affected; when they are exhausted, either perverted consciousness, loss of consciousness, or sleep, occurs. The fact that nothing calms the brain so much as closing the eyes indicates that consciousness is cerebral motion. To ask, what is consciousness? is much like asking, what is magnetism? each may be hypothetically considered to be a species of molecular motion, the one of a limited kind of nervous matter, and the other of a few special kinds of inanimate substance, such as iron, cobalt, nickel, oxygen, etc. "Consciousness is not co-extensive with mind, but is an incidental accompaniment of mind."—"It is only with a certain intensity of representation, or of

conception, that consciousness occurs "(Maudsley, "The Physiology and Pathology of Mind," second edition, p. 15). It appears to be a true and immediate effect of cerebral motion. The whole of essentially the same actions as those which we usually term intellect, viz., perception, observation, attention, comparison, judgment, etc., appear to occur automatically in the human brain in a lower degree when we are unconscious than when we are conscious, and they only arise into consciousness when their degree of activity is sufficiently great. If this conclusion be correct, consciousness is not a special kind of cerebral activity, but is entirely a result of a sufficiently high degree of cerebral molecular motion.

Consciousness and cerebral excitement vary directly together; there is every degree of consciousness, ranging from that of feeblest dreams to that of extreme pain, terror, and mania attending cerebral inflammation; hunger, thirst, and strong desire of any kind, tend to increase the intensity of it; extreme thirst has in many cases produced madness. Increased consciousness is well-known to be accompanied by greater flow of blood to the brain, greater oxidation of cerebral tissue, and greater cerebral waste. The consciousness of a stronger influence may inhibit or expel that of a weaker one. The desire to know what has been called "the inmost nature" of consciousness is frequently wanted by those who do not take the trouble to scientifically investigate, and it is unreasonable because it will probably require a practically infinite amount of labour and time to completely acquire it; it is much like wanting to know "the inmost nature of matter"—"the ultimate limits of knowledge," or "the final destiny of man"; in all such profound questions, we must be content to accept what information we can obtain, and wait for more evidence. As in the case of great pain, which is the highest degree of consciousness, there is in many cases the physical evidence of it in the form of redness, swelling, effusion of serum, loss of blood, etc., so may we reasonably infer that there are other kinds of physical evidence which we have not yet discovered in the feebler and more common cases of consciousness.

Consciousness is an effect of change of impulse; thus "first impressions are the strongest." "Consciousness ceases when the changes of consciousness cease" (H. Spencer). A high degree of consciousness is a strained condition of nerve substance, and cannot usually be continued a long time without nervous injury. Consciousness is intimately connected with sudden, and especially with unusual changes of cerebral impression; thus it quickly tires the brain to look at a long series of moving objects, especially those accompanied by a succession of varied, loud, and unusual sounds, every railway traveller is aware of this; it also strains it more to look at a series of bright objects than at dull ones, at white objects than at black ones, and persons have become blind by long-continued looking at the falling of snow. Light and heat, being each vibrations, excite the consciousness even when they appear to be uniform. Consciousness is

evidently affected by minute ingredients in the impressible nervous tissue; thus sedatives, narcotics, and anæsthetics affect it.

There are several reasons why consciousness appears so mysterious; first, because it is one of the most complex of all known phenomena; second, because it has only as yet been very incompletely investigated; third, because the human brain cannot simultaneously realise two contradictory impressions; and fourth, because consciousness cannot contemplate itself; a man cannot think of an idea and at the same instant think of that act of thought; and he can only arrive at knowledge respecting it by means of inference from other experience. The fact that whilst we are thinking intently of one idea we cannot at all think of another, is easily verified by closing our eyes, and concentrating our visual attention upon the sensation of darkness; all our ideas vanish at once, and remain absent as long as we maintain the necessary degree of attention. No single body in Nature can act directly upon itself. "How can Satan cast out Satan?"

Consciousness has a scientific basis, and its phenomena are essentially consistent with all other natural ones. According to the ordinary theory of molecular motion, that which is true in a kinetic sense of the motion of masses is considered to be true of that of molecules; no machine, whether natural or artificial, can perform two incompatible movements at the same time, and the human brain and body are no exceptions to this general truth. "The eye which sees all things cannot view itself" (I. Disraeli, "Miscellanies of Literature," 1840, p. 423). "As all the successional states of our consciousness correspond to successional vital states, and these occur according to the law of the vital forces, the signs which express the successional states of the one may be made to express the successional states of the other" (Laycock, "Mind and Brain," 1869, vol. ii, pp. 8, 9). That the human brain is strained by trying to realise two incongruous ideas at the same moment, is shown by the fact that the act of listening to two persons at once, or to a person who stutters or frequently alters his form of expression, produces confusion and sometimes even pain in the brain of the listener. It is by drawing off the attention of his audience to one phenomenon whilst he is performing another, that a conjurer performs his tricks unnoticed.

Chiefly in consequence of unfamiliarity with the great principles of science and with the scientific methods of discovering truth; and by using occult terms, such as the ego, the living soul, etc., unscientific theological, and metaphysical teachers and writers have greatly mystified the subject of human consciousness, and some have attributed it to supernatural causes. That it is really natural is, however, proved by the facts, that it is found only in nervous substance, and that it is influenced by material agencies and by natural conditions; we know that a few drops of prussic acid, or a single stroke of lightning, is sufficient to terminate its existence. As magnetism exists conspicuously only in iron, cobalt, and nickel, so consciousness exists in its greatest degree only in grey nervous substance.

Consciousness exists in different degrees in different bodies; rudiments of it begin to appear in the lowest kinds of animals and in certain plants, and it increases in distinctness of manifestation with increased complexity of the nervous structure of animals up to that of man. "We certainly know of many plants that not only 'feel' as accurately and sensitively as many animals, but exhibit a far higher range of sensation than animals of by no means the lowest grade" (A. Wilson, F.R.S.E., "Studies in Life and Sense," 1887, p. 315). Directly in proportion to the extent to which our ideas and nervous organs of sense are prevented from exciting the nerve-centres, either by the absence of stimuli or by severance or imperfect conductivity of the nerves of sensation, consciousness diminishes. Consciousness is increased by education, knowledge, and training; the most intelligent persons have usually the most varied, and the largest measure of it, and national consciousness has largely increased with the progress of civilisation. Originality and deep attention require great consciousness.

Consciousness usually decreases as automatic action increases; that which we do instinctively we often do unconsciously. Without consciousness we would be mere automata, such as we are during dreamless sleep. Consciousness, followed by observation, attention, comparison, and inference, enables us to superintend and regulate our actions in circumstances where instinctive action fails. There is a superintendence of human actions without consciousness as well as with it; during sleep, the actions of the heart, lungs, stomach, and other viscera, and of the digesting, assimilating, and excreting processes, are automically regulated by their own nerve-centres, and during the perfect waking state in the same manner, our other bodily movements being largely superintended by the senses and reasoning powers. The essential regulating power therefore of all our bodily functions is not a separate occult spirit dwelling within us and capable of existing outside us, but the natural stimuli within and without which are always present. A rational inference from this is, that we should each endeavour to secure such influences and environments as would enable us to live the most perfect life. "Man is wholly unconscious of the vital processes of vegetation going on within him" (Dr. Laycock, "Mind and Brain," 1869, vol. i, p. 159). He cannot feel the mechanical processes, nor the chemical ones which in a state of health are incessantly going on in every part of his body; neither the waste nor repair of his tissues; he does not usually feel the actions of his brain, his stomach, or of his liver, and only to a limited extent those of his heart and lungs. According to the same author, "the theory of plant consciousness cannot be either proved or disproved" (*ibid.*, vol. ii, p. 24). That we have some slight degree of general consciousness of our viscera is shown by the fact that we do not feel as if our body was a mere empty shell, and by the circumstance that when our viscera becomes inflamed we often suffer pain.

Consciousness, like many other physical and chemical actions, has a certain range of degrees of intensity, varying with the kind and strength of

the impulse and the percipient power of the structure; thus the ear can only perceive aerial vibrations, and the eye can detect only luminous ethereal ones, each within certain ranges of frequency, and neither can detect extremely feeble impressions. The late Dr. Tyndall focussed a beam of non-luminous heat rays upon his eye without being able to see it. As the strength of the impulses and the nature of the receiving structures vary, so does the consciousness, and as the eyes of no two animals are exactly alike, so one kind of animal is more, and another is less, conscious of luminous vibrations; thus owls and cats are said to be able to "see in the dark." So far as two conscious cerebral impressions are contradictory, so far do they annul each other, the strongest prevailing and determining our thoughts and actions; and so far as they harmoniously agree they reinforce each other and increase the effect. In the flavouring of medicines in order to make them acceptable, the flavour of one partly annuls that of the other, and the consciousness usually only notices the strongest, unless attention be specially directed to the weaker one. As the eye can, by attention, concentrate its vision upon a single object, and partly exclude impressions from remaining ones, so can the brain by attention concentrate its perceptive power upon a single impression and largely exclude all others, but in each case the impression is liable to be interfered with or blurred by the intrusion of others. It is commonly known that in order to consider or do anything well, we must only consider or do one thing at a time.

Automatism, consciousness, and intellect, constitute a series of nervous actions which merge into each other without any distinct division between them. "Evolution refuses to admit a sharp line of separation between a conscious and non-conscious part" of the animal structure, "and this decision is increasingly supported as our knowledge of the nervous system advances" (M. Foster, Encyclopædia Britannica, Article Physiology, p. 20); unconscious actions shade off into conscious ones as the composition and property of the parts of the nervous structure approach to that of the grey cerebral matter, and as the kinds of different groups of influences and vibrations which act upon the brain increase in strength. The action of impulses upon the brain is much like that of light or Röntgen rays upon a photographic plate; *i.e.*, the act of consciousness is attended by waste of nerve-substance (Herzen. T. Ribot, "Diseases of Personality," 1895, p. 7), just as the act of receiving a photographic impression is accompanied by a waste of chemical substance. "Persons under the influence of chloroform have heard themselves shriek whilst undergoing a surgical operation, but feeling no pain" (Laycock, "Mind and Brain," 1869, vol. ii, p. 443), thus proving that consciousness may under special conditions be cut off from one set of influences whilst being sensitive to another. Somnambulists also have their consciousness limited to certain groups of impressions, sufficient to find their way about, whilst not cognisant of others, and have been known to talk and reason, and draw erroneous conclusions in consequence of their limited sensations and perceptions. We are all of us, even in the perfect waking state, practically

asleep to all the influences and impressions of which we are not conscious, or to which we do not attend; and we all draw more or less imperfect conclusions in direct proportion to our lack of consciousness and of knowledge; we are only conscious of an extremely minute fraction of all the phenomena which exist and occur around and within us.

The whole of the foregoing illustrations of consciousness agree with the ordinary scientific views of molecular motion, and the cause of sensation will probably be found in change of such movement. As we know that there is no chemical change without molecular motion, and no thought or consciousness without chemical change in cerebral nervous substance, it necessarily follows that there is no consciousness or mind without molecular motion of nervous substance. Every person knows that foods support, and poisons destroy life; but it is not extensively known that consciousness, thought, and mental existence, depend essentially upon *alteration* of cerebral excitement due to changes of action occurring within and around us. There is "no perception without movement" or change (Ribot, "Psychology of Attention," 1894, pp. 11, 12), and consciousness is "only possible through change" (*ibid.*, p. 46). Without a *variation* of cerebral impression consciousness is not aroused. "When his mill stops the miller wakes"; it is not the mere presence or absence but the *change* of sound which wakes him. We see objects because our eyes receive from them non-uniform luminous impulses; and we hear sounds because our ears receive non-uniform undulations of the atmosphere. "All consciousness is of difference; two objects are the smallest number required to constitute consciousness" (J. S. Mill). We cannot even think of an event in time, or of a point in space, without reference to some other event or point; and as we do not know of any really fixed period of time, or fixed point in space, we are obliged to adopt arbitrary ones in order to obtain a mental impression. This non-uniformity of impression, as the cause of consciousness, is known as the theory of "relativity of impression"; it is not, however, generally recognised that this is only one small portion of a much more comprehensive truth, viz., that "all action arises from difference"; thus, the same general circumstance, viz., inequality of impression, which causes a stone to move, compels a man to feel; and it is because the liquid in a voltaic cell acts differently upon the zinc from what it does upon the copper that an electric current is produced. The fact that consciousness is dependent upon the same fundamental condition for its existence as the various physical and chemical forces is strong evidence that it may be regarded, like each of them, as being a particular species of molecular motion of the special substance in which it occurs.

Time and space (unlike light and heat), being perfect uniformities, excite no action upon our brain, we cannot feel or perceive them, and we only directly know of their existence by means of our reasoning powers. The rapid motion of the earth in its orbit, equal to about 67,000 miles an hour, being also exceedingly uniform, we do not feel it; and even the pressure of the atmosphere upon our bodies, equal to about fifteen pounds upon

each square inch, and the attraction of the earth's gravitation upon us, whilst they are uniform, we do not usually perceive; if, however, the speed of motion of the earth, the pressure of the air, or the attraction of the earth were to suddenly alter we should be instantly conscious of it; similarly, if we are in a moving vehicle, and it suddenly changes its speed, we at once feel it, or if we are rapidly let down a coal-pit we perceive a loss of weight. Without a *difference* of impression we cannot distinguish anything, and it is the most conspicuous and unusual difference, such as a powerful shock, sound, or light, which most impresses us; it is this circumstance which makes thunder, lightning, etc., so impressive. Sudden powerful changes from quiet to uproar, darkness to light, cold to hot, pleasure to pain, etc., excite consciousness strongly. We know further that unusual and changing impressions by exciting the brain prevent slumber, and when we wish to lose consciousness we exclude them as completely as we can. These examples, and other evidence, show that the existence of consciousness is essentially dependent upon a *variation* of physical state of the brain.

Intellect increases consciousness, thus all our perceptions are increased by the influence of contrast and comparison. If we suffered no pain we could not as fully appreciate pleasure; without the presence of "evil" we could not compare it with good, if there was no error we could not so readily distinguish truth; without the contrast of imperfection we could not so fully admire perfection, and the appreciation of happiness is heightened by the previous experience of misery. We cannot usually be sensitive to one thing without being also sensitive to its opposite, because the degree to which our consciousness is excited depends upon the difference, "the greatest pleasure is relief from pain." The power of mental contrast varies with the sensitiveness of the nervous system, the unrefined man is less sensitive than the refined one, both to pleasure and pain, an oyster has fewer pleasures and pains than a man; a plant is nearly if not wholly devoid of the power of perceiving either, because it has no distinct nervous system. Consciousness appears to be divisible in worms, polypes, etc., each section of one of which after division possesses a separate nervous system. Too much consciousness is not only painful, but is pain itself; mankind therefore resist too great or too rapid change even when it is for their ultimate advantage; in this fact lies the scientific explanation of conservatism.

Consciousness is excited in different degrees by different circumstances, most by violent phenomena and by the most tangible and conspicuous substances, usually more by solid bodies than by gases; thus gold, being a glittering, heavy body, was known many ages ago, but oxygen, a colourless gas, has not been discovered much more than about one hundred and twenty years, and the existence of the still less tangible universal ether has been known only a shorter period of time. It is usually the most conspicuous and sudden phenomena, and not the most important ones, which most excite us, and this is largely the reason why unintelligent persons have bad

judgments, they over-estimate the importance of superficial and conspicuous things and underrate that of deep-seated universal inconspicuous ones; in this way they overrate the importance of immediate pleasures and underrate that of their future evil effects, they over-estimate their own actions and under-estimate those of all things besides; this largely explains the connection between ignorance and conceit. Abstruse and profound ideas have very little effect in arousing consciousness.

Consciousness has never been observed in any other than nervous substance; it appears to be an immediate result of change of rate of oxidation of grey cerebral matter by the oxygen dissolved in the blood; all our nerve-centres, cerebral, spinal, and ganglionic, must have a supply of oxygenated blood. In cases of accidents to the skulls of animals in which the brain has been exposed, it has been observed that the brain contracted and became paler in colour during sleep; and that by any excitement which produced partial awakening it expanded and became red by an increased supply of blood. Mosso has shown that any disturbance during sleep sends blood to the brain. Our consciousness and perception are internal, but may be excited both by internal and external causes. Sensation and perception require time, we are never conscious of anything until after it has happened, because time is required to transmit impressions through the nerves and to excite the grey nervous matter.

The following instances show that consciousness is affected by mechanical pressure upon the brain:—"Dr. Hoy mentions the case of a youth who was struck insensible by the kick of a horse. After trephining the depressed bone he became sensible. Dr. Hoy took advantage of the hole in the skull to make firm pressure on the exposed brain after asking him a question. As long as the pressure continued he remained silent, but the instant it was removed he made a reply, never suspecting that he had not answered at once. He mentions another case of a youth who was rendered insensible by the kick of a mare named 'Dolly.' As soon as the depressed bone was removed he cried 'whoa, Dolly,' with great energy, and then stared about him in amazement, wondering what had happened to him. Three hours had passed since the accident. He was not conscious that the mare had kicked; the last thing which he remembered was that she wheeled round her heels and laid back her ears" (Maudsley, "Pathology of Mind," 1879, pp. 8, 9).

Consciousness is the basis of ideas and largely of mental action, without it there would be no memory, observation, intellect, or volition; no pleasure or pain, good or evil, morality or religion; and it is evident that moral duties and religious observances are not incumbent upon any person whilst they are unconscious, nor upon inanimate bodies. The very existence therefore of mind or "soul" and of the relation of science to morality and religion, depends upon the apparently insignificant fact of non-uniformity of physical and chemical action in the human brain.

Consciousness is a most rudimentary form of mental action, consequently its monitions are often misleading; the value of its decisions has often

been greatly over-rated; it frequently suggests to us untruth, because appearance and reality are often the opposite of each other; it does not often deceive us with regard to the simple act of feeling, though even in that simple matter it is not infallible (as in cases of perverted sensation); but with regard to the true explanation of it. It is far from being a true measure of magnitudes and distances, and frequently fails in the determination of positions, and in the case of extremely large or excessively small magnitudes it almost entirely fails. Mankind, during many centuries, trusting to its evidence alone, made very many great mistakes, with regard to the form and motion of the earth, the motions of the sun and stars, and a multitude of other phenomena.

Consciousness and unconsciousness are states which differ only in degree, there is no definite line of separation between the conditions of feeling and not feeling, or of sleeping and waking. According to Sir B. Brodie, the essential part of sleep is cessation of volition ("Psychological Inquiries," 1855, p. 137). There are different degrees of sleep; perfect unconsciousness is mental death; during perfect sleep there is no dreaming, no exercise of any of the senses, or of any of the mental powers. A sleeper is much like a vegetable (Dr. J. A. Symonds). The more perfect the state of sleep the shorter the night seems to have been on waking, and after perfect sleep there is very little perception of the intervening lapse of time. In accordance with the principle of inertia, and of the dependence of causation upon time, both the act of going to sleep and of waking occupy perceptible periods. The sense of hearing is usually the last to go to sleep, and the first to wake. During sleep the consciousness is more readily aroused by some sounds or changes of sound than by others; for instance, a mother is more readily awaked by the cry of her infant than by some other sounds. In cases when we determine beforehand to wake at an earlier hour than customary, we frequently sleep less soundly and are more easily aroused. The fact that in cases when we have retired to rest much later than usual, we commonly wake at our ordinary hour, indicates that the internal or external conditions which commonly arouse us have arrived. The last few hours of sleep are frequently the least sound and refreshing, owing in many cases to a gradual increase of acidity of the stomach, and changes in the viscera, which tend to excite semi-consciousness. In cases of dreaming cerebral energy is expended. Dreams are due to a great variety of causes, usually to excitement of some part of the cerebrum by anxiety or by an unhealthy state of the viscera, etc.; an indigestible or heavy supper usually excites them. It is well-known that various animals, for instance, dogs, horses, parrots, etc., dream, that fishes sleep, and that various plants are less sensitive whilst under the influence of anæsthetics. A man cannot sleep whilst standing because he easily topples over, but has been known to sleep whilst walking which tends to keep his body vertical; a bicycle topples directly it stops, in accordance with the law of inertia. The connection and flow of our ideas are usually much less under control, and our thoughts are much less truthful whilst

we are dreaming than during our waking state, because in the latter case they are corrected by a greater variety of impressions, and this largely accounts for the strange omissions and incongruities which occur in our dreams; it also agrees with the view that during dreams the blood is determined to fewer parts of the brain than during the waking state. A leading feature in dreams is that they are incomplete mental actions; the ideas of many persons in the waking state are in much the same predicament, though in a less degree, through deficiency of knowledge; *i.e.*, the persons themselves do not possess the necessary corrective impressions and do not perceive the incongruity of their ideas with facts. Some persons have dreams so impressive that on opening their eyes and seeing the objects around them they can hardly realise that they are at home, and by simply closing them they are instantly transferred in thought to the dreamland by a much more powerful impression than the waking one; others have become insane, and have actually committed murder and suicide through the influence of dreams (F. Winslow, "Obscure Diseases of the Brain and Mind," 1860, pp. 616, 617; Maudsley, "Responsibility in Disease," 1874, p. 252). Dreaming has been likened to a degree of insanity because the ideas in it are not corrected or controlled by comparison with others so as to make them truthful. A gentleman stated to the late Dr. J. A. Symonds: "I have dreamed that I was dead, and that I conveyed my own body in a coach to bury it, and that when I reached the place of burial a stranger said, 'I would not advise you, sir, to bury your body in this place, for they are about to build so near it, that I have no doubt the body will be disturbed by the builders.' 'That,' I replied, 'is very true! I thank you for the information, and I will remove it to another spot, upon which I awoke'" (J. A. Symonds, "Miscellanies," 1871, pp. 186, 187). Dreaming has been called "the delirium of sleep"; the dreamer, "a lunatic"; and "insanity is dreaming awake." "There is the closest resemblance between the mental condition of the dreamer and that of a lunatic" (*ibid.*, p. 196). "Dreams are the exact analogues of insane delusions" (Laycock, "Mind and Brain," 1869, vol. ii, p. 84). In habitual dreamers, the condition of dreaming often prolongs itself into the waking state:

> "'Till their own dreams at length deceive 'em,
> And, oft repeating, they believe 'em."
>
> —*M. Prior.*

Napoleon, at St. Helena, after a calm night, and within a few hours of his death, said to his attendant, General Montholon:—"I have seen Josephine, but she would not embrace me, she was seated *there;* she is not changed," etc., etc. ("History of the Captivity of Napoleon at St. Helena," by General Count Montholon). Multitudes of similar cases have been recorded, but they do not appear to have added much to our real knowledge; they have, however, produced much superstition, belief in miracles, etc., in unscientific

sectarians. Irregular or excessive circulation of blood in the brain during the act of dying sometimes produces hallucinations, ecstasy, etc. Physiology affords the best explanation of dreaming.

As consciousness is intimately related to a due supply of oxygen to the brain, any circumstance which within certain limits diminishes either the proportion of oxygen in the blood or the rate of supply of oxygenated blood to the brain, tends to produce sleep. It has been observed that:—(1) Cerebral excitement of all kinds, whether painful or pleasant, being attended by a greater flow of blood to the brain tends to prevent sleep; any physical discomfort also by continually arousing the attention has a similar effect; (2) repeatedly holding one's breath, breathing feebly and infrequently, as we do when we retire to rest, by reducing the degree of oxygenation of the blood promotes sleep; (3) breathing an atmosphere containing a little less oxygen has a similar narcotic effect; thus nearly all animals when preparing for sleep partly cover their nostrils and thus breathe over again the deoxygenated air from their lungs; the same method is to some extent effectual with man; (4) an unexciting gentle walk, sufficient to moderately tire the limbs previous to retiring to rest, promotes sleep by withdrawing a portion of blood into the limbs; a rapid walk, by exciting the heart, has the opposite effect; (5) sedatives, by decreasing the excitement due to pain, and soporifics and narcotics, by altering the composition of the blood, usually tend to induce sleep; (6) monotony of impression, such as a droning discourse in a comfortable place of worship, by diminishing cerebral excitement is well-known to promote sleep; (7) and so does a contented mind, and repeating the words "think of nothing"; and (8) keeping the body and extremities warm conduces to sleep by withdrawing blood from the brain According to Dr. A. Fleming "a state closely resembling profound sleep may be induced by simple compression of the carotid arteries in the neck" (Carpenter, "Mental Physiology," p. 572). Undulating sounds and dull monotonous thoughts conduce to sleep (Dr. J. A. Symonds). Intently gazing at a small and near object, as in the process of mesmerising and hypnotising, produces a species of sleep.

Sleep has been termed "death's brother," the "image of death," etc., it is essentially a temporary cessation of volitional life, leaving the organic functions in a modified but active state. It is in no degree a supernatural state; this is proved by the circumstance that it is entirely due to natural causes and conditions. Similarly as with all other phenomena, all the necessary causes and conditions must be present before sleep can be produced, and some must be before cessation of it can occur; whilst, however, a number of conditions must usually be present before sleep can be produced, often a single powerful influence will prevent it and will cause a sleeper to wake. One of the chief conditions of producing sleep is a certain degree of exhaustion or fatigue of the body and brain, by which the sensory ganglia are physically and chemically altered; during sleep, those centres being exhausted, are less able to respond to their

usual stimuli. That the kind of ideas present in the mind have a great influence in promoting or retarding sleep is well-known; thus anxious ones prevent it, and contented ones promote it, philosophic and optimistic ones, and the remembrance that "all things work together for good," conduce to slumber, whilst unphilosophic, pessimistic, and narrow personal ideas retard it; thinking of uninteresting trifles and trying to feel stupid conduce to sleep. We cannot directly produce sleep by an act of will, though we may assist it.

A great mystery has always been made of the phenomenon of sleep; it is simply a quiescent state of the nervous system which takes place when all the causes which usually excite sensation and thought are sufficiently feeble. When there is no undue light to cause vision, no sound to excite hearing, no odour, flavour, undue pressure, heat or cold, no painful feeling, no internal excitement, no active thoughts, sleep usually occurs. Probably an instrument of the nature of "a droning machine" might aid the effect. Various devices such as counting of numbers, monotonous music, etc., depending upon the same general condition of uniformity, have been proposed or used by different observers. "When Goldoni found his sleep disturbed by the obtrusive ideas still floating from the studies of the day, he contrived to lull himself to rest by conning in his mind a vocabulary of the Venetian dialect; translating some words into Tuscan and French, which, being a very uninteresting occupation, at the third or fourth version this recipe never failed. This was an act of withdrawing attention from the greater to the less emotion; by which, as the interest weakened, the excitement ceased." M. Mendelssohn (the author), in order to quiet his brain when it became excited, used to count the tiles on his neighbour's house (I. Disraeli, "Miscellanies of Literature," 1840, p. 415). The production of unconsciousness, however, is dependent upon such a number and variety of conditions that if only one of the essential ones remains unsecured the effect does not occur, and this explains the difficulty experienced by many persons in obtaining sleep. Sleeplessness does not directly kill persons; Sir Isaac Newton, in a letter to Locke, said that he "for five days together had not a wink of sleep." The late Dr. John Tyndall stated that he had remained as long as "ten days" without being able to sleep. "Boerhaave is recorded not to have closed his eyes in sleep for a period of six weeks, in consequence of his brain being overwrought by intense thought on a profound subject of study" (F. Winslow, "Obscure Diseases of the Brain and Mind," p. 604). "The maniac, whose brain is flooded with blood, cannot sleep often for many days together" (Dr. Fothergill). Our mental action we cannot directly repress by an act of volition, we can only gradually diminish it by indirect means; *i.e.*, by altering its environments. Sedatives do not stop mental action but only diminish physical sensation. A hearty meal, gradually and somewhat quickly prevents active thought by withdrawing blood from the brain; and every person knows that it tends to produce sleep. Probably the most effectual method of reducing general cerebral activity would be by employ-

ing for a while the whole of one's time judiciously in eating, sleeping, and easy walking in fresh country air.

That the phenomena of consciousness have their basis in the great truths and principles of science does not admit of doubt. It is an ultimate scientific fact that a substance cannot be in two different places at the same time; consequently when blood is determined to particular organs, or parts of organs, of the human body, usually its flow is at once diminished to other parts; and thus whilst the activity of one part of the nervous system is increased that of others is decreased. In consequence of these inequalities of activity, and the considerable number and variety of the faculties of the brain, and parts and functions of the nervous system, there have occurred and been reliably recorded, a great variety of actions performed by persons whilst in a condition of imperfect sleep, and of others during the waking state. Amongst these are dreaming, somnambulism, writing, reading, repeating, remembering foreign languages and long-forgotten events, comparing, reasoning, calculating, solving mathematical and profound questions and writing down the results; and in most of these cases the actions were performed with the eyes closed, and in a few with them open but without vision; in some cases the dreams or actions were more or less vividly remembered, but usually they were instantly and entirely forgotten; and in some very unusual ones during the waking state, vision appears to have been exercised by the nerves of other parts of the body than the eyes; and the interposition of ordinary opaque substances did not prevent it, as if Röntgen rays were acting upon the nervous system. A large number of such phenomena are recorded in works on mental physiology.

Amongst the examples of peculiar nervous action occurring are those in which one part of the brain or nervous system was asleep and entirely non-sensitive, whilst another part was in a highly excited state and the brain quite awake. This class of cases includes the phenomenon of ecstasy, which some persons of nervous organisations, have spontaneously, and others by imitation and habit, acquired; it is a state of intense emotion attended by entire voluntary attention to some absorbing idea, in which some see unreal persons, for instance, the delicate girl, Bernadetta Soubiros, at Lourdes, saw a female figure, which called itself "the Immaculate Conception"; others hear unreal sounds, or feel contact of non-existing things or persons; some are insensible to light whilst the eyes are wide open or the eyelids raised; others are insensible to pain, and feel nothing whilst being pricked with needles or pins, pinched, wounded, or even violently beaten, as in the example of the "Convulsionaries" of St. Medard. This class further includes those extreme cases of martyrs who have been burned to death at the stake protesting that they felt not the fire; and accounts of these cases have been promulgated far and wide by unscientific persons as examples of heroic Christian fortitude, and as miracles, supernatural events, and instances of direct inspiration by God, notwithstanding the well-known cases of inflictions of wounding, etc., with-

out any feeling of pain, experienced by Fakirs, Mandan Indians, and others, in their fanatical and tribal ceremonies. When a man prays very earnestly, his countenance sometimes changes, simply from the physical effect of the mental excitement of the nervous system, the blood leaving one part of his body to go to another part. Numerous instances of ecstasy, suffering without pain, etc., are recorded in books on mental physiology, by Maudsley, Carpenter, and others (see Moore, "The Power of the Soul over the Body," 1846, pp. 120, 125, 138, 220; "Brewer's Dictionary of Miracles," etc.). All these phenomena are very largely explicable by the aid of scientific knowledge, and will no doubt be further and more completely explained as such knowledge advances, without having recourse to supernatural notions. It would be very strange if out of the many millions of dreams and hallucinations which occur every year in England alone a small proportion were not sufficiently vivid to be considered realities.

It is well-known to the medical officers of insane asylums that persons in certain disordered nervous states are entirely devoid of sensation; a number of cases of this kind have occurred amongst the insane; they have purposely broken their ribs, tried to walk with broken legs, laid their heads upon the fire until they were extensively burned, thrust their feet into a bright blazing fire until the flesh was nearly burned to the bone, drank as much as a pint of boiling water, scooped out their eyes, cut away their tongues, held their hands in the fire until nearly burned off at the wrist, mutilated themselves by masticating pieces of glass, immersing an arm in boiling water until the bones were almost bare, and all without apparently suffering pain (F. Winslow, "Obscure Diseases of Brain and Mind," 1860, pp. 552-555). I once saw in an asylum a lunatic attempting to break his ribs by powerfully embracing a pillar, he having already a short time previously broken them in that manner. Others have been afflicted with very serious internal diseases without experiencing any pain (*ibid*).

44. Mental Action or "Mind."

Mental action is gradually being elucidated by means of scientific research. We know that the two hemispheres of the cerebrum, together constitute the centre of thought and volition; that without brain or nerve-centre there is no mind, and that brain is formed out of animal, vegetable, and mineral food, by what are termed "vital" processes. The average weight of a European man's brain is about 49 ounces, and of distinguished men 54½ ounces (Dr. Thurnam). That of a man averages fully ten per cent. more than that of a woman. "The brain of man belongs to the same type or pattern as that met with among apes and monkeys"; but there is "a much greater richness and complicacy of the 'secondary' fissures and convolutions; whilst a difference eclipsing all others in importance is to be found on the side of weight," that of man-like apes

being about 15 ounces (H. C. Bastian, "The Brain as an Organ of the Mind," 1890, p. 376). It has been observed that great surface of brain is requisite for the most complex cerebral actions; and that one hemisphere alone of the brain can carry on perfect mental action (Maudsley, "Physiology of Mind," 1876, pp. 264, etc.). The functions of the spinal cord are much like those of the brain, but more simple (*ibid.* p. 181). The chief functions of nervous substance and nerves are to receive sense impressions and to liberate and transmit energy. Brain and ganglia are sensitive to nerve impulses, but not to mechanical touch nor to being cut. "It is the great discovery of Descartes that the nervous system is that part of the body which is related directly to the mind" (W. K. Clifford). As the human brain is "a congeries of organs," so is the human mind a collection of faculties; the chief of which are perception, observation, memory, comparison, and inference. The mind of man is essentially similar to that of a dog, but more complex. Mental phenomena are exhibited in different degrees by all animals because they possess nerve-centres. "Man thinks, hence he is master over creatures which do not think" (Buffon). Most persons think too little, and many are anxious and think too much, and a very large number think injudiciously, they trouble themselves too much about little things, and pay too little attention to great ones. What we call mental pleasures are really agreeable actions of the brain and nervous system. "Curious inquiry into the world within him and about him is one of man's highest enjoyments, wholly irrespective of its uses" (Laycock, "Mind and Brain," 1869, vol. i, p. 13). As his collective thoughts constitute the mind of a man, so do those of a nation compose the mind of a nation. The fullest mental life is attended by consciousness, for without the latter there would be no appreciation of pleasure or pain, of happiness or unhappiness (see "Hallucinations," by E. Parish, 1897, chapter ix).

"Mind and its laws can only be known through the phenomena of life and its laws" (*ibid.*, p. 3). "The student of mental science must needs employ the methods of scientific research in general" (*ibid.*, p. 7); because there are no other known ones. "It is customary to speak of 'the Mind' as though it were a something having an actual independent existence—an entity, that is of spirit or incorporeal nature. Consequently we find, spread abroad in all directions, definitions of mind and descriptions of the powers of mind, which, to say the least, carry with them implications of a decidedly misleading character" (Bastian, "The Brain as an Organ of Mind," 1890, p. 138). Mind may be correctly regarded as a collection of properties and actions of different parts of the brain, and what we term "mind" always requires nervous matter, and has never been found without it. The mind grows with the body. "Of mind apart from body we have no direct experience, and absolutely no knowledge" (*ibid.*, p. 130). "An attentive consideration of"—"the same kind of evidence as that which assures us of the existence of our own bodies"—"altogether fails to assure us of the existence of 'the Mind' as a self-existent entity" (*ibid.*, pp. 141, 142). "Mind is never manifest except in a living organism" (G. H.

Lewes, "Physical Basis of Mind," 1877, p. 3). The human mind is an active condition of the brain which ceases during perfect sleep or unconsciousness (unless we call the action termed "unconscious cerebration" mind). According to Moleschott, "thought is a motion of matter"; and the entire mass of evidence relating to mental action indicates that thought is inseparable from cerebral molecular motion. We know that the only cause of motion is previous motion, that molar and molecular motion of external bodies produces motion of the universal ether, that motion of the ether causes molecular motion of the matter of the optic nerves, that such motion transmitted by them produces the sensation and idea of light in the brain; that thought is neither time nor space, and that motion of some kind is the only action it can be. The idea of "soul" is an abstraction (G. H. Lewes, "Physical Basis of Mind," 1877, pp. 339, 343). According to the metaphysical doctrine of Hegel, thought is equal to reality. The body is not a "prison of the mind," but a medium of connection and of mutual communication between the brain and the external world, and so far from the brain being a "drag upon the mind" it is the very reverse, because mental action depends upon it for its very existence, it is no more "a drag" than our legs are a drag upon our locomotion; no mental action has ever been fully proved to occur without a brain or nervous centre, and the more perfect the brain the more perfect is the "mind," provided all other conditions are the same. "The view entertained by the best cerebral physiologists is, that the mind is a force developed by the action of the brain" (The Editor of *Journal of Psychological Medicine*, July, 1870). It would be interesting to ascertain by actual experiment whether any of the different kinds of radiant energy, such as Röntgen rays, etc., concentrated upon local portions of the human head, have any perceptible effect upon mental action.

According to Buckle—"The most accurate investigators of the human mind have been the poets, particularly Homer and Shakespeare"; but although poets have beautifully delineated and described the extremely delicate and varied phenomena of the human mind, they have largely if not wholly failed to reveal to mankind the essential and scientific basis of its actions, without a knowledge of which all our ideas of it are only superficial. "Mind" is dependent upon brain because it is not proved to exist without it; but brain is not dependent upon "mind" because it can exist separately from it, as in the case of perfect sleep. By removing the brain, bit by bit, with the aid of a scalpel, the "mind" may also be removed in portions at a time, slowly at first but rapidly at last. "It must be confessed that the much-abused sentence—'Thought is in about the same relation to brain, as bile is to liver, or urine to kidney,' is one that no physiologist can refuse to endorse, as long as he stands only on the solid ground of facts as at present ascertained" (Henry de Varigny, *Nature*, vol. liv, August 27, 1896, p. 387). Wherever there is nerve-substance there are actions which have the appearance of being mental, and some physiologists believe that the presence of consciousness and

"mind" is not confined to the cerebrum, but exists in different degrees throughout the nervous system and the animal body (consult the writings of Bushnans, Bastian, Carpenter, Laycock, Lewes, Maudsley, Müller, Lindsay, and others). "Thought exhausts the nervous substance as surely as walking exhausts the muscles" (Dr. W. H. Day, "Headaches," 1880, p. 145). Nervous matter is characterised by being exceedingly responsive to a very great variety of feeble influences, viz., to light, sound, odour, flavour, and touch; and this power is intimately dependent upon its complex composition and structure and its semi-fluid consistency. Hippocrates called the human brain "the metropolis of humidity"; and physiologists have found "about 80 to 84 per cent. of water" in it (Laycock, "Mind and Brain," vol. ii, p. 281); it has been said that "spirit cannot dwell in a dry place," which is equivalent to saying that mental action requires moisture.

Considered as a real existing entity, entirely distinct from nerve-substance and the animal organism, there is no proper and sufficient proof of the existence of a separate "I"—"myself"—"my mind"—"soul"—"spirit"—"my inmost being," etc. When we persistently try to contemplate our "ego" the last trace of the supposed evidence of its existence disappears, because we find that the imaginary entity in the form of an idea changes and becomes a different one with every change, however slight, of cerebral excitement. Change is a most essential condition of mental action; change, either of kind or degree, of cerebral impression, produced either by external influences or by one part of the brain acting upon another, is attended either by an increase or decrease, or change of locality, of cerebral action, and produces consciousness, and with it either a different kind or a different degree of intensity of cognition and idea; without such change we could not perceive the external world nor even our own existence. We have no complete direct evidence of the existence of a human mind separate from the body, nor any indirect complete proof of it by means of inference; and there is no sufficient reason to conclude that real creation of energy in the form of soul or mind ever occurs, but only transformations of it in the brain (essentially the same as in all other substances), accompanying physical and chemical changes in it. We can no more think without cerebral nerve-substances than we can see without eyes, hear without ears, taste without palate, smell without nostrils, or walk without limbs, except so far as one part of the nervous system can take on a portion of the functions of another in some unusual or abnormal cases, such as those in which some degree of vision has been said to be exercised by the pit of the stomach. In some cases of lesion of brain, other parts of the brain take on the functions of the disabled ones (Laycock, "Mind and Brain," 1869, vol. ii, p. 472); similarly one organ can relieve the strain upon another. There is more mind in the vertebrate than in the invertebrate class of animals (W. Lindsay, "Mind in the Lower Animals," 1879, vol. i, p. 69). No amount of mental contrivance will enable us to disprove the justifiable inference that "mind," in itself, is a collection of the properties and actions

of nerve-matter. If it should happen to be proved that minds act upon minds through the medium of the universal ether, that will not at all prove the existence of supernatual "spirits" in space, but only that one brain acts upon another, somewhat like Marconi's transmitter and receiver in wireless telegraphy. The mind of man often expands in old age, and in states of ecstasy, inspiration, etc., not by being more freed from the body, but by greater determination of blood to the brain, as well as being occupied more upon great truths and less upon small ones, than during youth; such an action sometimes occurs immediately previous to death, and has been illogically considered to be a "vision of heaven."

According to some theological writers "the value of a single soul is infinite," but when we consider this question we find that life is altogether too short, and the powers of the human mind are altogether too feeble to justify such a conclusion; the universal practice of all nations and communities also contradict it. In all countries "every man has his price," and the lives and minds of some men are by common consent treated as being much more valuable than those of others. Human lives and souls continually disappear on this globe at a rate of above thirty millions each year. The assertion also raises the question of the relative values of the minds of other animals; and the doctrine has been made an excuse for committing a great amount of sectarian cruelty in the persecution and murder of "heretics," etc.

A number of cases have been recorded in which by accident or disease different parts of the skulls of human beings have been removed and the brain exposed; and in those cases it has been observed that during dreamless sleep the brain was motionless and lay within the cranium; during dreaming and imperfect sleep, it moved and protruded, the protrusion being considerable; and during active thought or lively conversation it was still greater and formed cerebral hernia. By placing one's hand upon its surface a peculiar leech-like movement would be observed in the brain, accompanied by a prominence and pulsation in the part whenever the corresponding feelings were excited. During any feeling of mental opposition the blood was sent with increased force to the brain and the pulsation became frequent and violent (A. Combe, M.D., "Principles of Physiology," 1841, pp. 317-319).

Nothwithstanding the foregoing and many other facts the existence of an "Infinite Mind" has been, and is still, extensively assumed as a fixed belief, and other great errors have been founded upon it. For instance, "The fact of intelligence in man has led on by necessary steps to the postulate of a supreme universal consciousness whose thought is the world . . . not as demonstrative knowledge, but as necessary hypothesis . . . so necessary, so fundamental, that without it all knowledge and thought whatever becomes unrelated, irrational, chaotic" (R. C. Moberly, D.D., "Reason and Religion," 1896, pp. 141, 142). In this case, such a postulate and hypothesis is not really "necessary," because another and more truthful one exists, and because science has shown us that whilst

there exist thousands of millions of instances of mind associated with brain, there is no proper or sufficient evidence of the existence of a single mind without it, and still less of a "supreme universal consciousness" without universal nerve-substance to manifest it. Further, and adding another great conclusion:—"If, for the very idea of a kosmos, we must assume one all-informing, omnipresent intelligence, how can we stop short, in our intellectual necessity, of a person whose intelligence it is" (*ibid.*, p. 143). Thus one great error leads to another, the illogical conclusion of the existence of "a supreme universal consciousness" is not now treated by the writer as a mere "necessary hypothesis" but as a fact, and is further expanded into the idea of "a person, whose intelligence it is"; but we must not forget that it is still based upon an assumption without proper and sufficient evidence and therefore unreliable; and that as the foundation is unsound, the entire superstructure falls with it. The very fact of drawing such enormous conclusions as the existence of "a supreme intelligence, whose thought is the world"; of an "omnipresent intelligence" and "a person whose intelligence it is," in the face of such opposing evidence, shows that unprovable hypotheses have been allowed to become fixed beliefs and to usurp the throne of reason. The probably true explanation is that "the wish is father to the thought," and that the ideas are excited by preconceived fixed impressions or by personal desire.

According to H. Calderwood, "the reality of the Divine existence is a truth so plain that it needs no proof," and "admits of none" ("Handbook of Moral Philosophy," 1875, p. 228); this fallacious idea depends upon the fact that all firmly fixed beliefs whether true or false appear so plain to the persons who possess them that they cannot be removed even by the strongest evidence.

Another writer (W. S. Lilly) states—"Reason seems a sure thing. Its conclusions are unimpeachable. But they leave us cold." . . . "We want a God that can interest us." . . . "Humanity will have a God-man ("The Great Enigma," 1892, pp. 299, 300); similarly, the selfish baby would have the moon, but he cannot really have it. Other dogmas, which need not be mentioned here, have similarly been founded upon the unprovable assumption that an infinite mind exists without a brain. In theology the most irrational assumptions are often adopted as settled truths, whilst in properly conducted scientific research hypotheses are only used as temporary questions, not as fixed beliefs; we cannot fixedly believe unprovable statements without suffering moral injury; and we are quite as much compelled to think and to act upon our thoughts as we are compelled to obey the power of gravitation; what we desire we expect, what we expect we believe, and what we believe we act upon. "Mind is not only inseparably associated with the primary forces of matter, but acts in and by those forces alone" (Laycock, "Mind and Brain," 1869, vol. ii, p. 7). Similarly to the eye accommodating itself to objects, so does the mind adapt itself to external impressions; but in careless minds the impressions often produce false ideas.

"The flow of thought is, like breathing, essentially mechanical and necessary, but incidentally capable of being modified to a greater or less extent by conscious effort" (O. W. Holmes, M.D., "Mechanism in Thought and Morals," 1872, p. 7). During the waking state thought is continuous, and we cannot directly stop it; even in the most profound thought there is a continual succession of more or less different ideas, cerebral and chemical changes. This may be easily verified by closing the eyes, contemplating intently the darkness, and trying to persistently think of that alone; the attempt is always a failure, we cannot continue more than a very short time to think of a solitary uniform idea, other ideas flit across our mental vision, and thought is compelled to change by exhaustion of the particular part of the brain. Continuity of thought and the impossibility of stopping our thoughts except by sleep are results of the continuous excitement, and the incessant change of thought is probably due to the continual changes of exhausted parts.

In accordance with the general truth that complex actions require complex material structures to perform them, so also mind, being the most complicated vital action or condition is manifested only by the most complex vital structure. "Our mental processes are rooted in our mechanism" (Maudsley, "Body and Will," p. 117). Mettrie, between the years 1709 and 1751, attributed all mental action to organisation. "By the study of physiology it has been placed beyond doubt that the nerve-cells, which exist in countless numbers, about six hundred millions according to Meynert's calculations, in the grey matter which is spread over the hemispheres of the brain, are the nervous centres of ideas" (*ibid.*, "Physiology of Mind," 1876, p. 259); but according to A. D. Waller the total number of nerve-cells in the human brain has since been estimated at "2000 millions" ("Introduction to Human Physiology," 1896, p. 528); in most persons and especially in ignorant ones, a large proportion of these cells are usually idle (Maudsley, "Physiology of Mind," 1876, p. 264); the "mind" sometimes grows as long as life lasts, the number of cells is so great. One writer allows "eight thousand ideas per square inch" of human brain (G. Moore, M.D., "Power of the Soul over the Body," 1846, p. 211). Consciousness and ideas are considered by physiologists to be produced by the action of the oxygenated or scarlet coloured blood upon the grey surface matter of the brain, and their formation is attended by the production of phosphates from the phosphorus contained in the nervous substance; because immediately after mental action these phosphates are found in the urine. Nervous matter contains "about 1·5 per cent. of phosphorus"; but after evaporation of all the water in it it contains "about 7·7 per cent." (Sir B. Brodie, "Psychological Inquiries," 1855, p. 161). As the action of thinking is attended by the production of phosphates, the conclusion has been drawn—"no phosphorus, no thought." "We are content to believe that without oxidation we can no more have thought from brain than we can have flame from fuel." "While the contents of nerves are neutral during rest in the living state, they become

acid after death and after great activity during life; the same is the case also with regard to muscle" (Maudsley, "Physiology of Mind," 1876). From the results of Professor Mosso's experiments we know that excitement of partial consciousness during sleep is attended by an increased flow of blood to the brain, and that in the waking state more blood flows to the brain during difficult than during easy mental action (G. Moore, M.D., "Power of the Soul over the Body," 1846, pp. 133, 134). "Although the brain of man has not ordinarily more than one fortieth of the weight of the body, yet it is estimated to receive from one-sixth to one-fifth of the whole circulating blood" (Carpenter, "Mental Physiology," pp. 38, 39); of that amount, about five times as much is supplied to the superficial grey cellular matter than to the white fibrous internal mass of the brain; the former portion being the one devoted more immediately to acts of thought, and the latter more to transmission of nervous energy. Profound study exhausts the brain far more than muscular exercise. "All our knowledge goes to show that the work of the brain, like that of the muscles, is accompanied by chemical change; that the chemical changes, though different in details, are of the same order in the brain as in the muscles" (M. Foster, F.R.S.). According to these statements, if there is no chemical oxidation of the grey matter of the brain there is no excitement of ideas, and therefore no "mind" or "soul." It is a striking circumstance that all the mental actions of man and therefore all his moral and religious ones, all his schools of learning, his temples of worship, his theatres, his means of mental communication, all his knowledge of literature, history, science, etc., depend for their existence upon the apparently insignificant circumstance that oxygenated blood so acts upon the human brain as to produce consciousness and ideas. Although scientific knowledge is not at present sufficient to account for all the phenomena of mind "in terms of matter" and energy, it is constantly progressing in that direction.

We know that mental actions are not only dependent upon physical and chemical conditions, but also that without cerebral nutrition and waste there is no thought, and that a fagged brain tends to produce inferior ideas. Mental action does not create energy, but only liberates it from the blood and nervous tissue. Poor food produces inferior blood and unhealthy thought; and to think properly, the blood in the brain must flow at a certain rate (Maudsley, "Pathology of Mind," 1879, pp. 39, 191-198). Too much cerebral excitement, caused by too great a flow of blood to the brain, prevents superior intellectual performances. The physical and chemical bases of mind are further shown in various ways; thus, it is well-known that bodily conditions affect men's minds, tempers, and moral conduct; that uric acid in the blood makes men peevish; that the mental and moral states of a man are largely dependent upon the condition of his stomach and liver, that prolonged fastings have produced mental excitement, hallucinations, and so-called "supernatural" visions; that estatics have unhealthy nervous organisations, and that lunatics and criminals often

have diseased brains. If you are dissatisfied with the world, look within, and see whether there is any internal cause of irritation before you look without or blame your fellow-men. Our thoughts depend greatly upon our food; "a good dinner lubricates business" (Lord Stowell). That mental ability is dependent upon natural causes is supported by the fact that a Newton or a Shakespeare has never been produced by savage nations nor in an excessively cold climate; and that people in remote villages have usually little minds. The mind, like the body, is injured by deficiency of proper training, the young man who spends too much of his time in amusements and physical exercise becomes the stupid old man. "It is difficult for us to understand the important physiological principle, that disturbed intelligence" (*i.e.*, worry) "has the same relation to the brain that disturbed respiration has to the lungs, pleura, and heart" (F. Winslow, "Obscure Diseases of the Brain and Mind," 1860). "There cannot be a clean heart without a clear head," nor usually a clear head without average bodily health. Those who are lean and meagre in kind are often uneasy in body and mind.

Climate has a great influence on mental characteristics. "Of all the climates of Europe, England seems to me most fitted for the activity of the mind, and the least suited to repose. The alterations of a climate so various and rapid continually awake new sensations, and the changes in the sky from dryness to moisture, from the blue ethereal to cloudiness and fogs, seem to keep the nervous system in a constant state of disturbance." "In the changeful and tumultuous atmosphere of England, to be tranquil is a labour, and employment is necessary to ward off the attacks of ennui. The English nation is pre-eminently active" (Sir H. Davy, "Consolations in Travel," 1830, p. 170). Similar remarks might be made, but in a stronger degree, respecting the influence of the climate of the Eastern States of America. We all instinctively recognise the influence of change of air and scene upon our minds by the desire for travel; when our minds are seeking rest we go to the seaside, the hills and moors. "It is no longer possible to evade the fact of our mental conditions being amenable to, and indeed being based upon, our physical conditions" (Dr. Fothergill, "Maintenance of Health," 1874, p. 267). The kind of food partaken of influences the minds of other animals as well as those of men; for instance, "A bear at Giessen was very gentle when fed on bread, a day or two on meat made him savage and dangerous" (*ibid.*, p. 132); carnivorous animals are usually more dangerous than herbivorous ones. Our food makes our thoughts; "so much logic, so much beef; so much poetry, so much pudding; and we all know that all growing things are but sponges soaked full of old sunshine" (O. W. Holmes, "Mechanism of Thought and Morals," 1872, p. 63).

Not only are our bodies largely composed of the dust of dead men and other animals, but many of our thoughts are ideas of the ancients, verified and extended by additional knowledge. The mind of man and all its ideas are primarily developed out of Nature by means of experience,

inherited tendency, and of inferences from our observations; and the leading truths of Nature gradually become the central ideas of mind. As the great object of education is to make mind a correct picture of truth, it is evident that we must view mind largely as a copy of Nature and not Nature as a product of mind. We are assisted into acquiring many of our ideas by the aid of automatic hereditary tendencies. It by no means follows that because we cannot divest ourselves of a particular idea that it consequently must be true, nor that because we cannot imagine an idea it must be untrue; multitudes of men have firmly believed many ideas which were utterly false, and have refused to believe others which were demonstrably true, and they are still extensively doing the same, especially in the subject of "religion." As the brain can receive impressions whether true or false, so "anyone may bring himself to believe almost anything which he is inclined to believe" (Archbishop Whately, "Detached Thoughts and Apothegms," 1856, p. 23); it is abstruse and complex impressions which we cannot understand that most produce false ideas. The brain is the "recording angel" to all men, and is the organ both of consolation and of remorse; in a case of remorse, some of the cerebral actions are inconsistent with others, and one part of the brain torments another part. Like a dyer's hands, the mind by habit becomes like that it lives in contact with. The untrained human brain, when in a state of excitement, is a seething mass of more or less harmonious and conflicting ideas.

According to G. H. Lewes, "ideas are not impressions at all; we have many ideas which cannot be reduced to sensible pictures." This is quite true with regard to some of them, the most profound ones, such as those of time, space, universal energy, etc., and with regard to the most complex ones, such as those of virtue, goodness, etc., because they cannot be sensualised, even in the form of visions, but can only be raised by means of inference. The great majority of our ordinary ideas, however, are intimately connected with impressions of some kind, because they can be very easily imagined, and because we are unable by argument to remove the strongest ones. We must have some distinct ideas or materials of thought in the form of impressions before we can raise imaginary, abstruse, or complex ones. It is largely because of deficiency of proper materials of thought, and of the power of reasoning from them, that "the multitude are incapable of grasping sublime conceptions" (Spinoza); and that theologians have been unable to realise a scientific basis of morality and religion. The order of increasing complexity of ideas is inversely that of their profundity; thus it is—simple existence, continuity, uniformity, time, direction, space; change, motion, the ether, energy, matter, etc.—add the ideas of continuity and uniformity to that of existence and they yield that of time; add that of direction to time and it raises that of space; add that of variability to space and it produces that of motion, and so on, and the ideas of existence and continuity pervade the whole. These are, however, metaphysical subtleties, and produce very little conscious effect upon the human brain.

Our thoughts are influenced and controlled, not only by the impressions made upon us by the external world and by our bodily states, but also by the language we employ; we can hardly think without employing some kind of language. In order to think an idea we make an inward effort to express the corresponding word, and we have only to mention the name of some object or action, and simultaneously a mental image of it arises within us. Mind is developed in brain both by actual things and by their representatives, such as pictures, words, etc. Language is a great aid to thought, and no man can think clearly unless he uses appropriate terms. Shakespeare is credited with having used fifteen thousand different words, and a farm-labourer with only about three hundred. Every bodily movement and position also tends to produce its appropriate idea, and conversely every idea tends to excite its corresponding posture and movement, and it is largely by keen perception of these slight changes of position, motion, muscular action, and features of countenances, that thought-readers infer their conclusions. Even a mere change of bodily position will oft-times enable a student to pay more attention to a subject, and this phenomenon is frequently exhibited by schoolboys during their studies.

That most of our ordinary ideas are cerebral impressions of some kind is also shown by the circumstance that the greater the earnestness and solemnity with which they have been impressed and the greater the number of repetitions, the more ineradicable are the impressions, especially if the ideas are impressed upon receptive young persons and continually repeated through life, or upon those whose other ideas appear to agree with them. That the cerebral impressions are of a physical character is shown by the fact, that similarly to the marks of small-pox, after they have once been powerfully fixed they can never be removed even by the person who receives them; also by the circumstance that not only the brain but other parts of the human body and of the bodies of other animals, are similarly capable of receiving by long-continued habit, permanent impressions which they retain throughout life, and in some cases are continued through several succeeding generations. It is well-known that in many cases not only the mental but the physical peculiarities of parents are frequently and largely inherited and visible in their children, and those of various animals in their progeny. In any case where an idea has been very firmly fixed upon the brain by long-continued and constant repetition, it is impossible to realise its contrary; thus we are unable to think of motion without thinking of a substance to be moved, because in all our impressions the two ideas have been associated together. It is also very much more difficult to remove a favourite selfish idea than to impart it. As ideas are often so fixed, it is a moral duty of all persons as far as possible not to acquire or to propagate, or instil into the minds of children, false or unprovable ideas, for it is well-known that their minds are like "wax to receive and marble to retain." But notwithstanding this, children are specially selected for the reception of unprovable dogmas by the most unscientific classes of theologians, and the progress of human

welfare and civilisation is largely retarded in this way. Such a state of things is necessary only in a low state of intelligence, but it is also necessary, in obedience to the law of evolution, to amend it, because that which injures one part of the community menaces and injures the whole.

> Whatever has been fixed upon the human brain,
> Shall be there impressed and fixed remain
> Until the life stream of the blood shall cease
> To raise it into thought and consciousness.

That the human brain and mind are subject to all the chief energies and principles of science does not admit of doubt. Every change of mind requires time, and the brain occupies space. Rapid talkers are rarely profound thinkers; some deep thinkers are very slow of speech; according to Swift, Sir Isaac Newton was very slow in answering a question (O. W. Holmes, "Mechanism in Thought and Morals," 1872, p. 39). The phenomena of mind are subject to universal causation and evolution, thoughts do not arise without causes; they obey the law of continuity; one idea produces another; mental action of the present is inseparably related to events in the past, and will be to others in the future, and the whole presents an unbroken thread of history extending throughout the entire period of human existence. Mind is essentially dynamic, dependent upon molecular, physical, and chemical change; it occurs in accordance with the principle of differentiation, thus one idea will often originate several; it is subject to the universal actions of growth and decay; it exhibits the phenomenon of acceleration in the spread of mental, moral, and religious epidemics, in religious "revivals," etc.; of inertia in the difficulty of altering the fixed beliefs of old persons; of momentum in the way in which multitudes are carried away like a flock of sheep, as in the fearful crusades and "holy wars," or by some popular preacher, orator, or politician; of action and reaction in the manner in which each man's opinions affect those of his associates and are affected by them; it is subject to the general principles of evolution and progress; and that it obeys the laws of conservation and equivalence of energy, will sooner or later be demonstrated, follows as a matter of course. Whether any mental influence of brain upon brain at a considerable distance occurs through the medium of the universal ether, is a suitable question for investigation by the Psychical Society.

Fewness of fundamental ideas conduces to insanity; the majority of lunatics are deficient in intelligence. In order to think with safety, we must be careful always to select healthful mental food; false ideas are more or less insane ones. The human mind, like the human body and stomach, must have frequent change of impression. Variety of corrective ideas is necessary to sound reasoning; the monomaniac is often a person who "makes a mountain of a molehill" by dwelling too much upon one idea. Just as football, athletics, boating, etc., supply changes of impression

to the body, so do theatricals, lectures, religious ceremonials, visiting friends, and travel, supply variety of impression to the mind. Society is necessary to health with nearly all animals, and sometimes even to life; animals of various kinds have in many instances been known to die soon after the loss of their companions; domestic animals, dogs in particular, are very fond of the society of men. Small communities are often mentally weak in some respects. "Woe to the man who is alone." Friendship decreases pain and increases pleasure. Solitude frequently produces false imaginations, and if we expect a thing it will appear to happen:—

> "In the night, imagining some fear,
> How easy is a bush supposed a bear."
> —*Shakespeare.*

Insufficient mental change sometimes brings suicide or insanity to the man who has remorse or self-reproaching remembrances. "A lady who had led an idle life imagined herself to be a pound of candles, and dreaded the approach of night, fearing the maid should take a part of her for use" (G. Moore, M.D., "Power of the Soul over the Body," 1846, p. 283). Children have become idiots by long continued solitary confinement. Caspar Hauser was an example of this (*ibid.*, pp. 345, 346). Confinement in solitary cells has often produced suicides, and to prevent this precautions are taken to have no hooks in the walls of cells in prisons. Rogue elephants, expelled from the society of their fellows, have very bad tempers.

> "Absence of occupation is not rest,
> A mind quite vacant is a mind distressed."
> —*Cowper.*

> "An idler is a watch that wants both hands;
> As useless if it goes as if it stands."
> —*Ibid.*

Even unvaried congenial society produces unhealthy effects; a man and wife may be too constantly in each other's company and need occasional separation. The evil effects of sameness of society have been conspicuously shown in monasteries and nunneries. "From the earliest period monastic life tended to develop insanity. But it was especially the convents for women that became the great breeding-beds of this disease. Among the large numbers of women and girls thus assembled—many of them forced into monastic seclusion against their will, for the reason that their families could give them no dower—and subjected to the unsatisfied longings, suspicions, bickerings, petty jealousies, envies, and hatreds so inevitable in convent life—mental disease was not unlikely to be developed. Hysterical excitement in nunneries took shapes, sometimes comical, but more generally tragical" (A. D. White, "Warfare between Science and Theology," 1896, vol. ii, p. 121). All these facts are included in the more

comprehensive physiological truth, that healthy life is continually varying motion; and he who believes the latter truth can easily infer the former ones.

Familiar acquaintance with great scientific truths is even a safer source of mental health than common-place human society; men change, but truth never changes; the fidelity of truth is perfect, but that of the dearest and most able friend is imperfect, and liable to be affected by self-interest; truth never flatters nor deceives, nor ever swerves to frighten or compel; it is the same once and for ever; but even the nearest friends must part, and the most faithful must change in views by age. Knowledge of great truths is a never-failing source of mental refreshment; he who has great ideas has the very best of society, because great ideas, such as that of the universality of causation, enable us to largely understand, and therefore to derive satisfaction from, nearly everything. True explanations always give us some peace of mind, because it is uncertainty which is the chief source of human anxiety; when we know the worst we are better able to consider what to do. Usually, next in essential importance to the society of great truths is that of good books and of good fellow-creatures.

The human mind must be active during the waking state, whether it is willing or not, and as no man is perfect, wrong ideas sometimes arise even in the best trained minds. As the mind can only entertain a very limited number of ideas at the same moment, and contradictory ones cannot co-exist in it, the only method of expelling evil thoughts is by exciting and attending to good ones. It is stated that the late Mr. Spurgeon's plan of excluding evil ideas was "to treat them as in Old England we used to treat vagrants, flog them well at the cart's tail and send them back to their parish," and he assures that he "did it, and conquered the enemy" (F. Winslow, "Obscure Diseases of the Brain and Mind," 1860, p. 666); but how this plan was practically carried out is not described.

Mental phenomena, although more complex than any other, are equally subject to power and law, and are therefore equally certain; uncertainty does not necessarily increase with complexity; for instance, our complex system of railway travelling is not less safe or certain, taking into consideration the number of passengers and of miles travelled, than that by the old stage-coach; nor is that exceedingly complicated structure, an ocean steamship, any more unpunctual than the simpler sailing vessel. As one idea automatically excites another, and we cannot prevent it, we are compelled, in complex cases, in accordance with the law of causation to draw conclusions; for instance, if I find the hand of a suspicious-looking stranger in my pocket, I am instinctively compelled to infer that he is trying to rob me.

The more complex a structure or faculty is, the greater is its corrective and guiding power; and this arises from the fact that it possesses a greater number and variety of properties, each of which can be separately affected by environments, and exerts a different corrective action. The human brain is affected by a greater number and variety of circumstances than

any other known substance; and the reasoning faculty can detect truth and falsehood in their endless variety of forms, because it is affected by every variety of similarity and difference. The active properties of our bodies and of our environments are the causes of our feelings, emotions, and desires, and these are the causes of our actions, ideas, and beliefs, but the more original causes of the properties of our bodies are the properties and molecular motions of the elementary solids, liquids, and gases which compose them and our environments (see section 42). "When the human machine is perfected by evolution" . . . "the moral sentiments will guide men just as spontaneously as do now the sensations" (H. Spencer).

"Mind," like each of the physical forces, may be viewed as a mode of energy existing only in nervous substance; as it is continually varying, differing from hour to hour, and from minute to minute, it cannot be an invariable entity, a real "ego," or else it must be a different one every instant. Personal identity is largely unreal. If either consciousness or "mind" is the "ego," then the "ego" during perfect sleep does not exist. The ego is only an abstract idea of a man's entire self. Although a man *feels* his identity from day to day, yet he *knows* that he is far from being the same, either in body or mind, as when he was a child; intellect corrects the feeling and decides the question.

Throughout the universe, so far as we know, whilst the total amounts of matter and energy remain the same, the conditions of all substances and the amounts of energy in them, are incessantly changing. With every change of condition of a substance, whether of its temperature, molecular motion, physical state, or chemical composition, there is a transference and a transformation of energy, a portion of one kind of energy being changed into another, and transferred from one body to another. In accordance with this, the mental condition of a man is not the same during two minutes together; with every act of thought some of the chemical energy of his brain is converted into heat, and it is well-known that much thinking makes the head hot. "It has been shown by experiment that among all the organs of the body the brain has the highest temperature" (Büchner, "Force and Matter," 1884, p. 293).

Mental action is largely attended by ideas; our ideas are of various kinds, and may be either true or false, simple or complex, of all degrees of abstrusity, of vividness, and of all degrees of complexity from those of the simplest fact to that of the most complex conclusion, or the most concrete visual impression. According to Sir W. Hamilton, Destutt-Tracy, and Charles Bonnet, the mind can have a distinct notion of as many as six objects at once, but according to Abraham Tucker the number is limited to four (Laycock, "Mind and Brain," 1869, vol. i, p. 153). Hooke estimated how many material impressions could be formed upon the human brain in a single day (*ibid.*, vol. ii, p. 5). According to Maudsley, two ideas cannot co-exist in consciousness at the same time ("Physiology of Mind," 1876, pp. 304, 305, 439); the conscious one may,

however, be either simple or complex; this statement agrees with the truth that the eye can only perceive one object or scene at a time, but the scene may be either simple or concrete; the former we usually realise the most completely. Of all our senses, vision is the most complex and intellectual, and excites the greatest variety of ideas. Profound ideas easily escape from consciousness, because the impressions they make are feeble; a book composed entirely of superficial ideas, such as light literature, can usually be written off-hand nearly perfect, but one composed of profound ones cannot, because whilst the attention is concentrated upon the abstruse ideas to prevent them escaping, some of the minor ones are forgotten, and numerous corrections have to be subsequently made. The more complex the nature of a subject, the more difficult is it to write upon it, because the evidence required is so comprehensive. The degree of difficulty of distinctly realising different ideas varies very greatly; thus whilst we frequently are able to clearly understand those of ordinary conversation uttered at the rate of one hundred and fifty words a minute, it sometimes requires numerous repetitions to obtain a clear impression of a single abstruse or complex idea in a subject with which we are but little acquainted, such for instance as that of polarisation of light. The number of ideas which can be simultaneously perceived by the brain appears to depend upon their nature and association; similar to the number of objects which can at the same instant be perceived by the eye, and varies from one, in the case of contradictory or inconsistent ideas, to several in the case of closely associated ones which form a mental picture. Ideas are very much more numerous than sensations or experience, because the processes of comparison and inference multiply them; they are also largely increased in number by combination and permutation, such as in the imaginations of poets, novelists, and others. The multiplication of compound ideas by combination of simpler ones is limited by the degrees of consistency. As in cases of chemical union, two unsuitable simple substances cannot chemically unite to form a compound, so in mental action two contradictory ideas cannot be combined together to form a complex one; contradictory ideas, however, admit of intellectual comparison in a high degree because of their great degrees of difference.

Our most fundamental, abstruse, and comprehensive ideas, such as those of existence, time, and space, are not direct results of experience, but are either largely or entirely results of inference from experience and evidence. They are also abstract and inferential in different degrees, beginning with that of simple existence, which is the most abstract of any, and appears to be entirely a product of inference—we have those of continuity, uniformity, time, space, motion, succession, causation, truth, etc. The idea of existence is the most simple and essential of all, and has no character or attribute; whilst the idea of truth has the attribute of consistency with all things.

According to the Rev. R. C. Moberly: "For good, or for evil, the real forces of the world are dominated altogether by ideas" ("Reason and

Religion," 1896, p. 50); but according to science the real energies which govern all terrestrial phenomena and all the actions of mankind are the incessant atomic and molecular motions which exist in all substances, the human brain included; man's ideas are inexpressibly feeble in comparison with those natural powers; and man can only dominate them at all, and then only in a minute degree, by first obeying them in such a manner that they shall effect his objects.

Our ideas are not real images of objects, such as those produced in a mirror, but are more or less truthful symbols of them as words are of things and events; they usually differ as much from the real objects as the word gold does from that of the metal itself; but they are nevertheless as much realities as the printed words on a page are real, and they are as useful as words which are symbols of ideas, realities, conditions, and abstractions; in some cases also just as twelve pence are the equivalent of one shilling, so is one idea an equivalent of another, and in other cases they are representative of the most intangible phenomena, such as time, space, molecular motion, virtue, etc. Our greatest ideas are extremely small in comparison with the great entities of the universe, and when great thoughts are suddenly thrust upon our attention we feel our mind expand by the general illumination of our other ideas and the strong excitement of our consciousness.

Just as there are separate nervous organs for separate senses, and separate sets of afferent or ingoing nerves to receive and convey to the brain and excite in it the impressions caused by flavours, odours, sounds, sights, etc., so there appear to be separate collections of nerve-cells in the grey matter of the brain which are excited by, and store up, particular groups of impressions and indvidual ones, and when at any time these particular cells are sufficiently excited by the contact of oxygenated blood, the ideas corresponding to the impressions appear in our consciousness. Every different mental action and occupation also appears to excite a different collection of parts of the brain. But this subject of physiological origin and location of ideas is a very complex one, and has only as yet, on account of the great difficulties attending it, been very imperfectly investigated, it is one in which we have to wait for more evidence.

We may safely affirm that every act of intellect has a cause, and that even ideas are not produced out of nothing; many of them are evolved out of previous ideas or impressions by combination, analysis, and inference. The fact that definite reliable conclusions cannot be arrived at in the absence of evidence is itself proof that ideas are not created. A commonly employed method of evolving new ideas is to carefully study the writings of others; new compound ideas are also constantly imagined by poets, novelists, and others instinctively by means of combination and permutation. An unlimited number of new ideas cannot be evolved out of a limited number of old ones; and without the discovery of new truths, advancement of knowledge and of civilisation would sooner or later cease. The number of new ideas, however, which it is possible to form by the

processes of combination and permutation even of only a few hundred old ones is practically infinite. To form some notion of this truth: "Were the combinations of the twenty-six letters of the alphabet perfectly free, so that any letter could be indifferently sounded with any other, the number of words which could be formed without repetition would be 67,108,863" (Jevons, "Principles of Science," 1887, p. 174). By the combined influences of mental education and the systemisation and co-ordination of ideas the intellect of man will in the future vastly increase in effective capacity. "English is said to consist of 250,000 words" (Max Müller, "Natural Religion," 1892, p. 284), and each word usually represents an idea. Hooke, the mathematician, calculated that the human brain is capable of entertaining about 3,155 millions of ideas (O. W. Holmes, "Mechanism in Thought and Morals," 1872, p. 29); and if the human brain was larger than it is, the number of ideas it could contain would probably be greater.

Consciousness of difference and similarity in the comparison of ideas is the basis of intellect. When we compare two ideas, it is by observing whether the effects upon our consciousness of the two immediately successive impressions are or are not the same; an act of comparison, however, includes not only the perception of two immediately succeeding ideas, but also of a third one, consisting of a recognition of their similarity or difference. Consciousness cannot perceive two contradictory impressions at exactly the same instant, and the perception of two successive unlike ideas is so rapid that we cannot always detect the minute period of time elapsing between them. In an act of profound thought, a man is conscious of that thought alone, and has no permanent recollection of any other simultaneous feeble impression. In strong intellectual action carried on without interruption we are largely unconscious of its method because we cannot survey it; thus, Sir Isaac Newton and other great thinkers have been unable to describe the mental processes by which they arrived at their greatest results. No one can consciously for any length of time pay attention to, and trace the sources of, his successive ideas, largely because he cannot think and at the same time survey his acts of thought. Before a man can think intently on one idea, he must clear his mind of all the others; thus we sometimes shut our eyes in order to concentrate our attention. Not only can we think intently of not more than one abstruse idea at a time, but we can usually only think of that one profoundly during a short period because the cerebral strain is too great, the mental impression soon becomes feeble, and yields to some stronger one. We usually perceive most that to which we pay deep and undivided attention; and that at which we do not mentally look we often do not perceive; for instance, we do not usually notice the contact of our clothes.

Attention has been usually defined as "a steady action or application of the mind"; also as "a predominant intellectual state" (T. Ribot, "Psychology of Attention," 1894, pp. 6, 105). It may be divided into involuntary, or that which is automatic and constant, being continually excited by

circumstances within and around us during the waking state; and voluntary, or that which is occasional, and requires an effort to maintain it; both are, however, essentially the same, and they merge insensibly into each other. Both are cerebral actions; the automatic is continually occurring, requires very little personal effort, and does not much tire the brain; the voluntary usually requires considerable effort, particularly in children and persons not trained to study, and, if long-continued, is very exhausting. There are all degrees of ordinary involuntary attention, varying from that of unexciting observation, through that of surprise, astonishment, and fear to that of terror, and varying in degree directly as the intensity of power of the stimulant and the degree of sensitiveness of the brain. The fact that attention is excited by influences within and around us proves that it is determined by natural causes, and in accordance with the great laws of science.

Attention is a kind of mental vision; if we look fixedly and continuously at some small object, during the first few seconds it appears clear and distinct, but after that its image gradually becomes dim and fades; similarly, if we think fixedly of some idea, it first becomes definite, then begins to fluctuate or oscillate, and in a short time becomes so weak that another idea intrudes and takes its place. In each of these cases the decline and disappearance is due to diminished consciousness, the existence of which is essentially dependent upon nervous and cerebro-chemical change. Attention to one object or one idea is usually a very unstable condition, because it is so liable, by becoming weaker, to be disturbed by the intrusion of others; it is partly these circumstances which gives rise to errors in taking astronomical and other observations. Long-continued attention strains the brain, and is liable to produce headache, giddiness, and other cerebral symptoms; and sudden noises during deep attention are very injurious. During deep attention breathing is partly suspended, and is sometimes followed by sighing, which relieves it by oxygenising the narcotised blood. Powerful attention to one idea prevents and inhibits attention to others; fixed attention to any one of our organs, or to any locality of our body, is well-known to determine blood to that part and withdraw it from others. It is reputed of Sir B. Brodie that he could feel a sensation in any part of his body by strongly directing his attention to it, and everyone knows that a sensation of itching is increased by merely thinking about it; stigmata of nervous females have a similar origin.

In consequence of the intimate relations of all parts of the brain to all parts of the body, and the great scientific principles of universal relation, and of action and reaction, strong attention greatly influences the functions of the heart, lungs, and other viscera (G. Moore, M.D., "Power of the Soul over the Body," 1846, p. 242). "Attention to any part of the body is capable of exalting the sensibility of that part, or of causing the consciousness concerning its state to be affected in a new manner. Thus a man may attend to his stomach till he feels the process of digestion; to his heart, till conscious of its contractions; to his brain, till he turns dizzy

with a sense of action within it; to any of his limbs, till they tingle; to himself, till tremblingly alive all over; and to his ideas, till he confounds them with realities" (*ibid.*, p. 268).

It is by repetition and practice that the greatest power of sustaining attention is developed. Without a strong degree of voluntary attention, multitudes of objects and ideas would either not be perceived at all, or not be clearly perceived. Attention is often of very great practical value in going through life; Dr. Livingstone was able to write, even under most distracting conditions, the accounts of his geographical discoveries. Great power of attention is indispensable to the attainment of eminence in legal and in scientific subjects. It is by strongly concentrating our attention upon ideas and comparing them that we obtain original ones. With profound thinkers, knowledge of the art of forgetting, with the ability to practise it, is also very important in order that they may be able to dismiss their ideas when it is necessary. This object, however, cannot be entirely or directly effected by any command of the "will," but only by indirect means; such as (1) by occasionally changing from mental to bodily labour, but even this must not be violent, for a man cannot without injury work hard with his muscles and with his brain; (2) by changing the subject of his study to something of a very different character; or (3) by fulfilling the conditions of sleep (see section 43). Strongly fixed ideas are often more difficult to forget than remember; and if they are true and important they become the great and instinctive guides of our life; but if they are untrue they are apt to produce monomania, untruthfulness, hatred, etc.

"There's many a trouble
Would break like a bubble,
And into the waters of Lethe depart,
Did not we rehearse it,
And tenderly nurse it,
And give it a permanent place in the heart.

"There's many a sorrow
Would vanish to-morrow,
Were we not unwilling to furnish the wings;
So sadly intruding,
And quietly brooding,
It hatches out all sorts of horrible things."

—*G. Clark.*

"Let it be observed that children, women, and light minds in general are capable of attention only during a very short time, because things awaken in them only superficial and unstable feelings; that they are completely inattentive to high, complex, and profound questions, because these leave them cold; that they are on the contrary attentive to insignificant things because these interest them" (T. Ribot, "Diseases of the Will," 1894, p. 81). It requires more time to excite attention to important subjects in unintelligent than in intelligent persons. "Most men are grown-

up children" (Napoleon), and only a small proportion of persons have great power of thought. The ability of attention is not confined to man; many animals, such as dogs, horses, monkeys, elephants, asses, etc., pay attention to the commands of their masters. Some animals can learn and some cannot; thus, according to some naturalists, a hawk is teachable but a buzzard is not. According to Darwin:—"A man who trained monkeys used to purchase common kinds from the Zoological Society at the price of £5 for each; but he offered to give double the price if he might keep three or four of them for a few days in order to select one. When asked how he could possibly learn so soon whether a particular monkey would turn out a good actor, he answered that it all depended upon their power of attention. If, when he was talking and explaining anything to a monkey, its attention was easily distracted, as by a fly on the wall or other trifling object, the case was hopeless. If he tried by punishment to make an inattentive monkey act, it turned sulky. On the other hand, a monkey which carefully attended to him could always be trained" (Descent of Man," vol. i).

Attention is an essential condition of the formation of high intellect; without the continuous mental perception known as attention, long trains of connected thought could not be carried out. All great discoverers, mathematicians, and philosophers have possessed it in a high degree. Mathematical study greatly develops the power of attention, and Newton was a conspicuous example of this. "The difference between an ordinary mind and the mind of Newton consists principally in this, that the one is capable of the application of a more continuous attention than the other; that a Newton is able without fatigue, to connect inference with inference in one long series towards a determinate end, while the man of inferior capability is soon obliged to break or let fall the thread which he had begun to spin. This is, in fact, what Sir Isaac Newton, with equal modesty and shrewdness himself admitted. To one who complimented him on his genius, he replied that if he had made any discoveries it was owing more to patient attention than to any other talent" (Sir W. Hamilton, "Lectures on Metaphysics"). Strong and long-continued attention is very exhausting; Newton told Mr. Machin that his head never ached but when he was studying the difficult and profound subject of lunar inequalities (D. Nasmith, "Makers of Modern Thought," 1892, vol. ii, p. 268). When a man studies a profound question he simply fills his mind previously with all that is known about it, and then places himself in such circumstances that he can pay undivided attention to it, so that all the other conditions and natural influences relating to the question shall act freely, and without disturbance, upon him. The most common circumstances which prevent persons thinking deeply about abstruse questions are lack of knowledge and the continual interference of ordinary occupations.

Nearly all the greatest and most refined mental work has been done by men whose brains were not only highly trained to attention but also very sensitive; not only stored with full knowledge of their respective subjects,

but capable, by their sensitiveness of perceiving the faintest indications of novel or profound truths, of detecting the most refined differences of consistency and accuracy of statements in science, and of deviations from perfection of harmony and usefulness in art. Most of the great works in art, literature, poetry, and music have been done by men capable of exerting isolated action, and complete mental abstraction or power of idealising the objects of their thought; men whose brains during their most active employment were in a nearly ecstatic condition. A man's finest thoughts, conceptions, language, and composition, often occur to him when his imagination is very active, also when he is in a condition hovering between the dreaming and waking states; they occur at such times when the brain is least disturbed by extraneous circumstances, and it would be a great acquisition if there existed some improved means of securing them. The least interruption will often dispel our best thoughts for ever:

"The web of thought, we may assume,
Is like some triumphs of the loom,
Where one small simple treadle starts
A thousand threads to motion,—where
A flying shuttle shoots and darts,
Now over here, now under there.
We look, but see not how, so fast
Thread blends with thread, and twines and mixes
When lo! one single stroke at last
The thousand combinations fixes."

—*Göethe.*

During deep study there should be nothing to distract, and everything to favour the attention; the favourable conditions vary somewhat with the idiosyncrasies of the individual, thus, Newton smoked tobacco; "Milton listened to his organ for his solemn inspiration; Curran meditated whilst playing his violin" (I. Disraeli, "Miscellanies," 1840, p. 414). "It is usually in proportion as we can suspend the exercise of all our other senses that the liveliness of our conception increases" (*ibid.*, p. 415). "Malebranche, Hobbes, Corneille, and others darkened their apartment when they wrote" (*ibid.*). Great mathematicians have on various occasions been so deeply absorbed by thought as to become quite oblivious to all surrounding circumstances. Sir Isaac Newton was often quite unconscious of surrounding objects and events during deep meditation; and it has been said that sometimes he even forgot his meals. Every human brain is more conscious of some changes than of others; thus a mother usually wakes on the least cry from her baby, whilst she is not awoke by much louder sounds from other sources.

An uncommon mind may or may not be irrational. Insanity is mental action uncontrolled by intellect, and is most common in persons of untrained minds and in sentimental enthusiasts. "Men seldom or ever go mad from great intellectual activity, if it be unaccompanied by

emotional agitation" (Maudsley, "Responsibility in Disease," 1874, p. 299). There appears to be a close relation between insanity and some kinds of genius, usually most in the cases of musicians, poets, and literary men, and less in scientific philosophers, because truthful philosophy greatly promotes mental health by producing general consistency of thought. One of the greatest differences between a philosopher and an artistic genius is, that the chief ideas of the former are rational whilst those of the latter are often merely imaginative; the leading fixed thoughts of rational geniuses are consistent with all known truths, whilst those of imaginative ones are more or less inconsistent. The human mind is limited in capacity, and the minds of great men, being continually occupied by great ideas, are compelled to neglect small ones and forget some of the conventionalities of life, and this is considered by little minds as a proof of defective intellect; common persons often think that philosophers are fools. Insanity is far more associated with ignorance and false beliefs than with genius. "Genius is a disease of the nerves" (Moreau). "A want of equilibrium of nervous system" (J. F. Nisbet, "The Insanity of Genius," 1893, p. 56). If real genius is insanity, then Shakespeare and nearly all the greatest philosophers must have been insane. "Genius resembles insanity as gold resembles brass" (Dr. Hirsch, "Genius and Degeneration," 1897, p. 116). "No one has succeeded in giving a pregnant definition of genius" (*ibid.*, p. 71). Buffon said that scientific genius "is only protracted patience." Cuvier stated: "In the exact sciences at least it is the patience of a sound intellect, when invincible, which truly constitutes genius." "Infinite patience is the truly scientific spirit" (J. Morley). Helvetius said: "Genius is nothing but a continued attention"; and Lord Chesterfield remarked that "the power of applying the attention steadily and undissipatedly to a single object is a sure mark of a superior genius." With regard to eminence in scientific invention, "two per cent. is genius, and ninety-eight per cent. is hard work" (Edison, *Review of Reviews*, April, 1898, p. 382). Labour without genius is often more successful than genius without labour, because real genius requires much labour. Like Michael Angelo, the true genius says:—

> "I will persevere until the work
> Is wholly finished, or till I sink down
> Surprised by Death, that unexpected guest
> Who waits for no man's leisure but steps in,
> Unasked and unannounced, to put a stop
> To all our occupations and designs."
>
> —*Longfellow.*

Genius is sometimes perilous, and occasionally "great genius is to madness near allied." "Natural philosophers, men who remember, collect, and think on facts, usually live longer and are less disposed to insanity than poets and persons who delight in imagination, without an orderly and proper cultivation of memory" (G. Moore, M.D., "The Power of the

Soul over the Body," 1846, pp. 202, 269). "The most intellectual are generally also the most sensitive of mortals" (*ibid.*, p. 269). "Genius, genius! take care of your carcass" (C. Reade). Dryden was subject to nervous tremors when he composed poetry; and Buffon, when absorbed in some subjects, "felt his head burn, and saw his countenance flushed" (I. Disraeli, "Miscellanies of Literature," 1846, p. 424). Mendelssohn, the writer, when too much excited, went to his window and counted the tiles of his neighbour's house to calm his brain (*ibid.*, p. 415). Hobbes had "occasional terrors," and Rousseau's phantom scarcely ever quitted him, even for a single day (*ibid.*, p. 428). Göethe was rarely happy, and felt sometimes inclined to commit suicide. Pope was once insane; Smollett also, and was in a state of dreaming during half a year; Tissot was in a stupor for six months. Petrarch, Tasso, Pascal, Cowper, Descartes, and many other brain-workers, suffered somewhat similarly (*ibid.*, p. 427). Faraday was obliged to suspend mental work for several years. Wollaston died of a diseased brain, and carefully watched the progress of his disease (G. Moore, M.D., "The Power of the Soul over the Body," 1846, p. 301). Wilkie was often unable to bear daylight; and Paganini could sometimes hardly bear to hear a whisper in his room (*ibid.* pp. 300, 301). Sir Joshua Reynolds, when much excited by his work as an artist, saw trees in lamp-posts and moving shrubs in men and women; and Dr. Watts "thought his head too large to allow him to pass out of his study door" (*ibid.*, p. 260). Even Milton's "Paradise Lost" has been termed "a sublime hallucination," and Michael Angelo's paintings, "elaborated dreams" (*ibid.*, p. 169). "Many of the Italian improvvisatori possess their peculiar faculty only when in a state of ecstasy" (Dr. Copland, *ibid.*, p. 262). A large number of similar cases are quoted by J. F. Nisbet in "The Insanity of Genius," 1893. Such effects as the foregoing are the natural and usually unavoidable prices which have to be paid for eminence, especially in poetry, art, and literature. Longfellow, however, by means of great care, avoided such extremes. Southey's advice to a poet was: "Be sure when you dream of your subject, to lay your work aside for a few days." If your mind is much distressed, by want of quiet, need of rest, fly to the hills and moors :—

> "With curious art the brain too finely wrought
> Preys on herself and is destroyed by thought;
> Constant attention wears the active mind,
> Blots out her powers, and leaves a blank behind—
> The greatest genius to this fate may bow."
>
> —*C. Churchill.*

> "Great wits are sure to madness near allied,
> And thin partitions do their bounds divide."
>
> *Dryden.*

Ruskin said: "I went mad because nothing came of my work" (Maudsley, "Natural Causes, etc.," 3rd edition, 1897, p. 217, quotation

from *Fors Clavigera* Second Series, Letter the Fourth). "In November, 1807, Sir Humphry Davy was seized with very severe fever in consequence of the excitement and fatigue which he underwent when engaged in the researches which led to his splendid discovery of the alkali metals. The laboratory of the Royal Institution was crowded with persons of every rank and description, and Davy was kept in a continual state of excitement; and his fever was the effect of fatigue and an over-excited brain. Such was his celebrity at this period that persons of the highest rank contended for the honour of his company at dinner, and he did not resist this gratification, although it generally happened that his laboratory pursuits were not suspended until the appointed dinner hour had passed. On his return in the evening he resumed his labours and usually continued them till three or four o'clock in the morning, and yet the servants frequently found that he had risen before them. The state of his health became so serious that for many weeks his physician regularly visited him four times a day, and the housekeeper, Mrs. Greenwood, never retired to bed except one night during eleven weeks" (Dr. A. Combe, "Principles of Physiology," 1841, pp. 330-331). Usually, "It is not pure brain work, but brain excitement or brain distress, that eventuates in brain degeneration and disease. Calm, vigour, severe mental labour may be far pursued without risk or detriment; but, whenever an element of feverish anxiety, wearing responsibility, or vexing chagrin is introduced, then come danger and damage" (Dr. Crichton Browne, see "Maintenance of Health," by Dr. Fothergill, 1874, p. 262).

Insanity is very much more common amongst religious enthusiasts than scientific ones, because a number of the leading ideas of the former are inconsistent with known truths, whilst those of the latter are harmonious with them; and because truthful ideas usually exclude irrational ones; whilst also sectarian enthusiasm is largely due to intellectual weakness and uncontrolled feelings and desire, scientific ardour is largely regulated by the intellect. Mysticism, supernaturalism, fanaticism, hysteria, and too constant attention to theological ceremonies and observances are very common preludes to insanity, and are largely consequences of scientific ignorance. Religious "camp-meetings" and "revivals" are especially favourable to mental disease. Hysteria and fanaticism act largely by suggestion, sympathy, and imitation, and are very contagious; that they are chiefly physical in their nature is largely proved by the circumstance that similar sympathy and imitation operate in many animals; for instance, when one dog barks a number join in chorus; when one animal in a menagerie becomes excited, many others become the same, etc. The contagiousness of excitement in large assemblies is illustrated by the numerous cases of "religious hysteria" which occur at meetings of the Salvationists, Negro-Methodists, etc., and such excitement has often been termed "the influence of the Holy Spirit" and "the madness of crowds." The violent changes of mental feeling which occur in such cases are probably due to corresponding fluctuations of chemical change and nervous

energy in the brain and other nerve-centres, much like the fluctuations of electric state in electric telegraph wires. Great use is made of this excitability of the nerves and nerve-centres by various classes of religionists, evangelists, etc., as a means of producing "conversions." "Spiritual exaltation runs naturally inevitably into licentiousness, unless held in the iron bands of discipline to the moral law" (Baring Gould, "Historic Oddities," 1891, p. 14). Suggestion has a large influence in many cases of delusion and of more or less insane cases of self-deception and hallucination; the suggestions being due in many cases to internal excitement of the nerve-centres started by some slight circumstance; thus "Napoleon, before important events, battles, etc., saw his star in the sky"; "Luther insisted that he often saw the Devil" (Dr. Hirsch, "Genius and Degeneration," 1897, p. 91); he also stated, "When in the year 1521 I lived in my Patmos, in a room in which nobody except two pages who brought me my food ever set foot, one evening when I lay in bed I heard the hazel nuts move in their sack, and quite spontaneously throw themselves against the roof and all about where I lay. I was hardly asleep when I heard a great noise, as if a quantity of nuts had been poured out. I raised myself and called out, Who art thou? I commit myself to Jesus Christ" (*ibid.*, p. 85). St. Paul was subject to trances, and considered himself the object of supernatural influences. Most persons have experienced "fancies," *i.e.*, unreal or insane delusions in a small degree; for instance, they have been awakened by an imaginary knock at their bedroom door when no knock has occurred. The "mediums" employed by spiritualists and mesmerists are usually persons whose nerve-centres are very sensitive to suggestion in a somewhat similar way. The "inspiration of the poet" is also a highly exalted state of those centres. Whilst insanity consists largely of false ideas, it is not all false ideas which are usually considered insane. The majority of so-called ghosts and apparitions are probably subjective delusions caused by local excitement in particular parts of the brain in which the impressions or allied ones are located. Supernaturalists and theosophists sometimes induce trance and an exalted nervous state in which they hear sounds and see visions, by holding their breath, by fixedly looking at some object, and by other means:—

> "I have read in the marvellous heart of man,
> That strange and mystic scroll,
> That an army of phantoms vast and wan
> Beleaguer the human soul."
>
> —*Longfellow.*

A constant habit of reasoning is the greatest preservative against insanity, and it is exceedingly doubtful whether an extensive use of the human brain in the act of reasoning, or in those of comparison and inference in broad scientific questions, if free from anxiety, ever made a man insane, because insanity and correct reasoning in any subject are incompatible.

Hobbies preserve some men from insanity by giving them suitable change of mental occupation; but "to lay down the principles of mental hygiene on a scientific basis, would, alas, be to offend many cherished beliefs, and to go counter to the convictions of all but a small minority of mankind" (Maudsley, "Responsibility in Disease," 1874, p. 288).

Ordinary cerebral wear and tear is directly proportionate to the degree of attention exerted; automatic thoughts do not tire the brain like those which require deep consideration. Profound study and long-continued attention is very exhausting, and but few men can sustain it during many hours at a time, especially if the ideas attended to are very abstruse or complex. A chief reason why abstruse ideas quickly exhaust the brain is because they cannot be directly imagined without the immediate presence and assistance of other ideas; and why complex ones have a similar effect, is because their constituent ideas have to be rapidly surveyed in succession; and each of these actions requires a greater supply of blood to the brain. Attention, in the case of vision, consists largely in an adaptation of the focus of the lens to the distance and size of the object; and in the case of the mind, attention may also be in some degree an adaptation of the cerebral receiving apparatus to the impression. That which we call "thinking of nothing" is feeble automatic attention, that unobtrusive stream of feeble ordinary thought which passes through our minds without any excitement, and almost without our perceiving it. "All manifestations of mental life can by turns be either unconscious or conscious" (T. Ribot, "Diseases of Personality," 1895, pp. 12, 46); "one may by unconscious cerebration solve a problem" (*ibid.*, p. 15); problems have also been solved during dreams (Carpenter). According to G. H. Lewes:—"We often think as unconsciously as we breathe." The charming away of warts is probably effected by "unconscious cerebral action," in which the brain consciously set in motion upon a fixed object, continues to act upon it automatically and unconsciously.

That surrounding circumstances do in some degree affect the human brain and nervous system, even when we do not directly perceive them, is illustrated by the effects which follow anæsthetic tooth-drawing, and by the following quotation:—"Even modern warfare . . . does not hinder men from thinking and writing when they are used to it. Geoffroy St. Hiliare never worked more steadily and regularly in his whole life than he did in the midst of the besieged city of Alexandria. 'Knowledge is so sweet,' he said long afterwards in speaking of this experience, 'that it never entered my thoughts how a bomb-shell might in an instant have cast into the abyss both me and my documents.' By good luck two electric fish had been caught and given to him just then; so he immediately began to make experiments, as if he had been in his own cabinet in Paris, and for three weeks he thought of nothing else, utterly forgetting the fierce warfare that filled the air with thunder and flame, and the streets with victims. He had sixty-four hypotheses to amuse him, and it was necessary to review his whole scientific acquirement with reference to each of these

as he considered them one by one. It may be doubted, however, whether he was more in danger from the bombardment or from the intensity of his own mental concentration. He grew thin and haggard, slept one hour in the twenty-four, and lived in a perilous condition of nervous strain and excitement." "It is possible to be absorbed in private studies when surrounded by the most disturbing influences; but even in these cases it would be a mistake to conclude that the surroundings had no effect whatever. There can be no doubt that Geoffroy St. Hiliare was intensely excited by the siege of Alexandria, though he may not have attributed his excitement to that cause. His mind was occupied with the electrical fishes, but his nervous system was wrought upon by the siege, and kept in that state of tension which at the same time enabled him to get through a gigantic piece of intellectual labour, and made him incapable of rest. Had this condition been prolonged, it must have terminated either in exhaustion or in madness. Men have often engaged in literature or science to escape the pressure of anxiety, which strenuous mental labour permits us at least temporarily to forget, but the circumstances which surround us have invariably an influence of some kind upon our thinking, though the connection may not be obvious" (Hamerton, "The Intellectual Life," p. 438). Similar remarks apply to a studious man in a worrying household; he is constantly being irritated subconsciously.

In accordance with the universal principle of mechanical action and reaction between substances and different parts of substances, the brain acts upon the body and the body reacts upon the brain; a diseased or healthy body tends to produce a diseased or a healthy mind, and similarly with the action of the mind upon the body; as high fever tends to produce madness, so madness tends to produce high fever. Each special mental state tends to produce a particular physical one. Culprits have fallen dead on the scaffold through suddenly receiving news of their pardon (G. Moore, M.D., "Power of the Soul over the Body," 1846, p. 314). Rage sometimes makes the saliva poisonous (*ibid.*, p. 315). Anxiety produces slow fever, suppresses the saliva and gastric juice; based upon this fact, guilty persons have been detected of theft in India by making them masticate rice (*ibid.*, pp. 317, 318). Mental depression congests the liver, and grief enfeebles the action of the heart (*ibid.*, pp. 319-321); anxiety vitiates the milk of mothers and nurses (*ibid.*, p. 323). In some cases the mere witnessing of a disease has produced the disease in the spectator and caused his death (*ibid.*, p. 327). Descartes, who was in love with a girl who squinted, could never speak of her without squinting (*ibid.*, p. 207). "It is certain that a nude or nearly nude figure writhing in physical suffering or in the convulsive agony of death, and with blood flowing from its wounds, has a singularly stimulating effect upon those functions of the brain that are most apt, when they overpass physiological bounds, to transport it into ecstasy" (Maudsley, "Natural Causes," 3rd edition, 1897, p. 255); many such figures may be seen in Catholic churches; and it is stated that "St. Theresa's first attainment to the ecstasy of divine love, after long

yearnings, doubts, strainings, and agonies of mind, was on the occasion of discovering and contemplating with rapt emotion a very realistic picture of a martyred saint—I think it was St. Joseph—which she discovered hidden away somewhere in the convent" (*ibid.*). "Evidently the ardent spiritual love . . . resulted sometimes in a voluptuous ecstasy in which the saint felt herself received, like St. Catherine of Sienna, as a veritable spouse into the bosom of her Saviour" (*ibid.*). Other and more striking evidence of the great influence of mental upon bodily action, and the converse might be readily adduced if it was necessary.

All phenomena require time, and thought is no exception to this. Whilst all persons say "I must have time to think," many believe that thought is instantaneous. It takes time even to form the simplest idea, and usually a much longer time to form a comparison, or to draw an inference. Professor Donders of Utrecht invented an instrument for registering the amount of time occupied in different mental processes, and by its assistance he ascertained that the period required by a man of middle age to form a simple thought, is about one-twenty-fifth part of a second; also that the time is longer in some persons than in others, and longer if the subject of thought is one with which the thinker is not familiar. The fact that the production of ideas requires time is in harmony with the general truth, that the formation of mechanical impressions on a plate of metal by means of blows of a hammer, or of impressions produced by impulses of light upon a photographic plate, also require time, and the period required is longer the less the degree of sensitiveness of the receiving substance. According to Professor Cotell, "colour is not seen unless it is at least one-hundredth of a second on the retina; one-tenth of a second gives the maximum impression"; "it takes about one-quarter of a second to translate words into a familiar foreign language; half a second to multiply the numbers of the multiplication table; and three-fourths of a second is the interval of time which can be most accurately conceived" (*Review of Reviews*, July, 1893, p. 51).

There is a considerable degree of similarity between the ideas produced by vision and the impressions formed by light upon a photographic plate, because they are both caused by vibrations passing through an optical apparatus and making an impression upon a sensitive surface. That all ideas have a material basis in the brain, and are inseparably associated with some form of more or less durable impression upon the grey cerebral matter, is further indicated by the high degree of permanence of strong mental impressions, especially those made during childhood, those caused by vision, and those produced by very great personal calamities; such impressions are never worn out, and only disappear by softening or disintegration of the brain during life, or by death. It is well-known that old persons remember more tenaciously some of the events of their childhood than those of later periods. "The sight is the most intellectual of all the senses"; "the eyes are the windows of the mind," and next to them the ears; the overworked brain is more relieved by closing the eyes

than by any other means, and next to that by quietude. Next to the reasoning power, vision is the most protective and guiding agent. The sense of sight is the most sensitive one; persons have been struck blind by very strong and vivid light, such as a flash of lightning; and been rendered deaf by explosions. Most of our remembrances are visual ones.

"THE BRAIN AS A PHOTOGRAPH.

"I have seen a wondrous mirror, that wherever you might place,
To the North, or South, or East, or West, by turns its glassy face,
You saw therein reflected forms of mountains and of woods,
And weather-beaten moss-grown rocks, and ever-chasing floods.

"In so far it did not differ from an ordinary glass,
O'er which the landscape outlines flit, and vanish as they pass;
But in this they did not vanish; for a wonder-working spell
From the hand of an enchanter fixed the outlines as they fell.

"And I marvelled as I saw it, for so the human will
Can thus catch and bind the shadows, and bid the clouds be still,
Can arrest the flying bird, and command the mountain brook
To halt in its down-tumbling and stand fast as th' eternal rock,
So that not within the forest leaves a breath of summer air,
Not a ripple on the waters but may leave its trace somewhere."

The analogy of seeing and thinking is very close; thus, we speak of a sphere of vision and one of thought; "we see a truth; we throw light on a subject; we elucidate a proposition; we darken counsel; we are blinded by prejudice; we take a narrow view of things; we look at our neighbours with a jaundiced eye," etc. (O. W. Holmes, M.D., "Mechanism in Thought and Morals," 1872, p. 18). As the human eyes, when using a stereoscope, can, by accommodating themselves, combine two non-coinciding flat images into a single one appearing in relief, so also can the human brain combine a number of heterogeneous cerebral impressions into an harmonious whole; and in both cases, immediately preceding the effect, the incongruous impressions slip as it were into seemingly harmonious combination, and form an apparently rational picture. In this way untruthful dogmas enter into our minds, appear consistent, and becoming fixed by repeated impression, defy the power of evidence and of reason to remove them.

The material foundation of ideas is still further indicated by the circumstance that our mental impressions are rendered more tenacious by frequent repetition. Many a man repeats a falsehood, or listens to it, until he firmly believes it; numerous monomaniacs are produced in this way. It is in some cases more easy to learn than to unlearn, and the oldest teachers are often the most opposed to new truths. Some of the greatest opponents of new scientific truths have been teachers of religion, whose false ideas have been fixed by long-continued repetition during many years of teaching; but even a false belief, if it is strongly fixed and not

disturbed, anchors the mind, and gives it some degree of fallacious peace. Acquired ideas become by long-continued repetition practically the same as innate ones, we are now used to many things that we can hardly imagine their absence; thus, we are so used to freedom that we can hardly imagine universal slavery.

Fixed mental habits are almost impossible to be overcome even by the subjects of them; those who have been accustomed to command rarely acquire ability to obey; and this agrees with the saying, "schoolmistresses make bad wives." The permanence of strong mental impressions is a very important circumstance in the moral and religious evolution of mankind, because it is one of the chief elements which determine the rate of progress of new knowledge and of civilisation; old brains with their old ideas must die before younger brains with their newer and more advanced ideas can supplant them. False fixed ideas retard progress, whilst true ones promote it. Most men and women have some dominant or ill-balanced ideas which last through the whole of their lives, and which are often called tastes; such as unduly large ideas of the importance of wealth, dress, pictures, etc., and those ideas largely affect many of their thoughts and actions.

Mental actions may be divided and classified in various ways; for instance, into intellectual, moral, and social, or into the more definite and simpler ones of perception, observation, comparison, and inference, with the concurrent ones of attention, volition, and memory. In addition to these, there exist a large number of complex cases in which mental and nervous actions act together in various proportions; these include what are termed emotions, sentiments, and feelings. All of these actions are fallible, but those of trained intellect and reason are usually the least so.

The minds of all intelligent persons act in accordance with what are called the "fundamental laws of thought," viz.: (1) The law of identity, illustrated by the statement whatever is, is; (2) the law of contradiction, illustrated by the proposition a thing cannot be and not be; and (3) the law of duality, exhibited in the statement a thing must either be or not be. These three axioms may, perhaps, be more properly called "laws of Nature," and "rules of thought" based upon them, because they agree with our universal experience, and with the modes in which we have been led to think by that experience. As agreement with Nature and true inference from it is the sole test of truthful scientific belief, these three logical axioms must be assumed and admitted in all correct reasoning in matters of science; and in all correct arguments we must reject all ideas which contradict them or any of the great truths of Nature. (Compare Thomson, "Outlines of the Laws of Thought," 1875, p. 211; Jevons, "Principles of Science," vol. i, 2nd edition, p. 5.)

The real operations of the mind, consciousness, perception, observation, attention, comparison, inference, and judgment, are developed out of, and merge into, each other; thus, consciousness becomes perception, percep-

tion increases to observation, observation intensified is attention, observation of two ideas develops comparison, dual comparison produces inference, and comparison of inferences evolves judgment and wisdom. All comparison is of similarities and differences. That which is quite incapable of comparison is incomprehensible. Comparison is more varied in man than in other animals.

We know that the most intellectual faculties are comparison and inference. As the eye is to the other senses, so is inference or reason to the other mental powers; it is the most complex, the most purely intellectual, and the most reliable, because it compares all the circumstances, and its results are the most consistent with truth. An act of inference implicitly contains, and is a comprehensive summing-up of all the essential parts of the evidence supplied to it by the senses, consciousness, perception, observation, and comparison. Facts are the witnesses, comparison is the examining counsel, and reason is the judge. We must not base conclusions directly upon desires, but only upon proper and sufficient evidence, otherwise we arrive at false ones.

> "Within the brain's most secret cells
> A certain Lord-Chief-Justice dwells,
> Of sovereign power, whom one and all,
> With common voice, we Reason call."
>
> —*Churchill.*

"Reason is that faculty which, by comparing together two propositions bearing a certain relation to each other, becomes cognisant of a third proposition" (W. G. Davies, *Psychological Journal*, 1862, p. 649); it is the chief faculty by means of which we discern truth, detect error, and ascertain the causes and explanations of things. When we reason we prove a definite relation between two things. Reasoning is the process by means of which, from certain propositions known or assumed, certain other propositions termed conclusions, follow as a matter of necessity; and they necessarily follow because the original propositions implicitly contain them; the conclusions are evolved, not created; if the data or premises are false, the inferences from them are incorrect. "Philosophy is the science of pure reason," and reason, based upon proper and sufficient evidence, is the final arbiter in all disputed questions. Reason is a summing-up by all the mental powers. "The faculty of reasoning may be defined as the power we possess to correlate, confirm, or correct simple impressions, and to deduce probabilities from given facts" (M. Dorman, "From Matter to Mind," 1895, p. 195). As all theological questions have to be finally referred to the intellect to decide them, they are all of them liable to interences of greater or less degrees of probability:—

> "The powers of all subdued by thee alone,
> Is not thy reason all these powers in one?"
>
> —*Pope.*

Whilst reason is usually termed the "highest" of our personal possessions, and the animal powers the "lowest," it is the natural controlling power of all our voluntary actions; our bodily structure is the basis and supporter of all our intellectual powers, and the most necessary to our existence, but neither is really "higher or lower." The great majority of human beings will probably be never entirely governed by reason, because men will never be all exactly alike, nor possess exactly the same knowledge; and a certain degree of conflict caused by their difference is necessary to progress. "He who will not reason is a bigot, he who cannot reason is a fool, and he who dares not reason is a slave" (Sir W. Drummond); the latter is the case with multitudes of persons who accept important dogmatic statements without inquiry. "Religions are various, but Reason is one" (Chinese proverb). According to the late Cardinal Newman: "After all, man is *not* a reasoning animal; he is a seeing, feeling, contemplating, acting animal" ("A Grammar of Assent," 1870, p. 91). In going through life, however, nearly every man is compelled to reason more or less, and he is therefore a reasoning as well as a feeling and acting animal; when men contemplate they usually reason.

Many persons imagine that the essential process of reasoning is very complicated; this, however, is not correct. When we perform an act of inference, or reasoning, we never create knowledge, we only explicitly state in a new form of words what we have already implicitly stated in the propositions, for instance in the statement, all metals conduct electricity; copper is a metal, therefore copper is a conductor of electricity, we only state clearly in the conclusion what we have already implicitly stated in the premises. "Reasoning is essentially . . . neither more nor less than putting things together in a way that will suggest to the mind some new information or conclusion" (Dr. J. A. Symonds, "Miscellanies," 1871, p. 101). "Reason is natural revelation" (Locke), and it is so because it enables us to evolve new truths and predict new knowledge and events; unprovable assertions are not revelations, but questionable statements.

That the process of logical reasoning is essentially very simple is shown by the fact that it can be performed by means of a simple mechanical contrivance, consisting of a few pedals, pulleys, and strings, termed a "logical machine," invented by the late Professor Jevons, F.R.S. That machine "is an analytical engine of a very simple character, which performs a complete analysis of any logical problem impressed upon it. By merely writing down the premises or data of an argument on a keyboard respecting the terms, conjunctions, copula, and stops of a sentence, the machine is caused to make such a comparison of these premises that it becomes capable of returning any answer which may be logically deduced from them. It is charged, as it were, with a certain amount of information which can be drawn from it again in any logical form which may be desired. The actual process of logical deduction is thus reduced to a purely mechanical form, and we arrive at a machine embodying the 'Laws of Thought,' which may almost be said to fulfil in a substantial

manner the vague idea of an organon or instrumental logic which has flitted during many centuries before the minds of logicians." "The machine does not supersede the use of mental agency altogether, but it nevertheless supersedes it in most important steps of the process." "Mechanism is capable of replacing for the most part the action of thought in the performance of logical deduction. Having once written down the conditions or premises of an argument in a clear and logical form, we have but to press a succession of keys in the order corresponding to the terms, conjunctions, and other parts of the propositions, in order to effect a complete analysis of the argument. Mental agency is required only in interpreting correctly the grammatical structure of the premises, and in gathering from the letters of the abecedarium the purport of the reply. The parts of the machine embody the conditions of correct thinking." "At every step in the progress of a problem, the abecedarium necessarily indicates the proper condition of a mind exempt from mistake." "The logical machine may become a powerful means of instruction at some future time by presenting to a body of students a clear and visible analysis of logical problems of any degree of complexity, and rendering each step of its solution plain." "My machine performs logical inference" (Jevons, *Philosophical Transactions of the Royal Society*, vol. clx, pp. 516-518). "The machine can detect any self-contradiction existing between the premises presented to it" (*ibid.* "Principles of Science," 1887, p. 111); which is more than can be truly said in many cases of the reasoning powers of the human brain. In algebra, and in Jevons's Logical Calculus, the operator during the operation does not require to know the meanings of the symbols; he thinks of the laws of the symbols alone; similarly the symbolic method in algebra gives greater intellectual power; and mathematics and algebra condense thought.

An indispensable condition of correct reasoning is mental consistency, *i.e.*, consistency with all our truthful ideas; and as all truth is universally consistent, so should all thought be. Reasoning consists in the substitution of similars, "what is true of a thing is true of its like" (Jevons). If we admit a term, we must also admit its synonym and all that it includes. If we agree to a statement or reason, we must be prepared to admit its equivalent and all that flows from it. If we agree to a principle, we must allow all the facts it includes, and abide by all its logical deductions and consequences. If we say certain phenomena are facts, we must allow the general statement which expresses them; in short, we are bound to admit in one form of words, any idea which we have already admitted in another. Dogma, opinion, and hypothesis must not only yield to experiment and observation, but to all they include and to all that logically flows from them; thus, it is illogical to affirm that "the soul is of infinite value," unless there is a sufficient evidence to prove it. "The doctrine that logical reasoning produces no new truths, but only unfolds and brings into view those truths which were, in effect, contained in the first principles of the reasoning, is assented to by almost all who, in modern times, have

attended to the science of logic." "In this manner the whole substance of our geometry is reduced to the definitions and axioms which we employ in our elementary reasonings; and in like manner we reduce the demonstrative truths of any other science to the definitions and axioms which we there employ" (Whewell, "Philosophy of the Inductive Sciences," vol. i, p. 67). The properties of all substances living or dead, are probably in a similar manner deducible from the geometrical relations of their molecular movements; and will probably be so deduced in the future. "The results of geometrical reasoning are absolutely certain" (S. Jevons, "The Principles of Science," 1887, vol. i, p. 268). In logic lies the secret of all that is and all that is to come (Hegel); this is true in the sense that if we possessed sufficient knowledge of the universe and sufficient logical power, we might predict from all that is all that is to come. By means of inference and reliable data we acquire wisdom and the gift of foreseeing future events; and largely the ability of acting morally.

Although the process of reasoning does not empower us to create new truth, it enables us to render manifest, and thus to convert into available knowledge, truths which were previously locked up in a latent potential state in our antecedent knowledge. It further shows that although we evolve new ideas by its use, we cannot, by means of study and inference alone, evolve an unlimited number of new ideas from a limited collection of antecedent ones, because the utmost possible number of combinations, permutations, etc., of old ideas, although very large, is itself limited; and more especially because the mind of one man can only imagine each idea in a small number of aspects, and in only one aspect at a time. We can draw more inferences and extract more new knowledge from a statement, the fundamental ideas of which we are acquainted with, than from the same statement if we do not know those ideas; and the number of aspects in which we can view a statement depends upon the variety and extent of our knowledge; it also increases with the progress of science, because every newly-discovered truth is related to and throws additional light upon, many other previously known ones. To imagine an idea which is really new and important is usually a very difficult matter; "all that the mind can do in the creation of new existences is to alter combinations, or by analogy to alter the intensity of sensuous impressions" (Jevons, vol. ii, p. 141). It is often by putting two ideas together that new ones are conceived.

As all the scientific facts we possess are gained, either directly by means of experience, including that of ourselves and others, or indirectly by means of inference from such experience, and as our intellect is only rationally influenced through the medium of such facts and the conclusions we draw from them, anything which cannot, directly or indirectly affect our consciousness, or is not evolved from facts or sensory impressions by intellectual processes cannot affect our reason. A thing, therefore, which is without properties or relations (if there could be such a one) is to us incapable of being known, and cannot be rationally imagined

or reasoned upon. We only know of the properties and relations of the intangible existences, time, space, the universal ether, energy, universal molecular motion, etc., through the medium of matter, and of matter directly by means of our senses. A real thing entirely without properties is not only inconceivable, but is inconsistent with all known things and with all known truths, and is therefore impossible; we need not, therefore, search for "supernatural" existences or phenomena.

Our intellectual faculties are very feeble; we can only acquire a knowledge of abstruse truths, laws, and principles, by laborious processes; we have to study facts again and again, and come to them repeatedly in a new frame of mind, to view them in varied aspects in order to discover the knowledge they contain; and even then we are only able to extract a portion of the truth that is latent in them; and much of what we do extract is liable to be contaminated by our previous mental errors. Before we begin to reason we must clear the subject of all extraneous elements, because all unnecessary ideas confuse our minds. Our minds are so weak in comparison with the infinite magnitude and apparently endless complexity of Nature that no man is able to adequately realise the ideas of universal truth, universal goodness, etc., in all their relations, and we can only come to the conclusion that the entire system of Nature is universally consistent and good, by reasoning from the fact that as it is connected throughout by universal law, none of its parts can be essentially inconsistent with each other. Our most intellectual powers, inference in particular, are usually the least developed; many persons can scarcely reason at all. We cannot reason without employing language; we think by the aid of words, sounds, pictures, object-lessons, material substances and their phenomena, all yielding brain impressions, and all our ideas must have, either directly or indirectly, a material basis. There are, however, limits to which symbols constitute an aid to thought; cerebral impressions produced by representative signs are in some cases very inadequate in reviving certain kinds of impressions; there are many impressions which we receive which cannot be either fully or adequately described in words; for instance, music, the emotion of grandeur in Nature, of the beautiful in painting and sculpture, the extreme degrees of mental and physical pleasure and pain which we experience, etc.

Anyone who thinks rightly thinks logically, whether he understands the rules of logic or not; and anyone who writes properly writes grammatically, whether he understands the rules of grammar or not; and similarly, anyone who measures or calculates accurately, does so mathematically, whether he understands mathematical forms and symbols or not; and anyone also who discovers new truths, usually thinks truthfully, whether his method of discovery accords with the views of other discoverers or not; Faraday was an illustrious example of this.

An indispensable condition of drawing correct conclusions is consistency of our ideas with the actual truths of Nature; erroneous views usually prevent our drawing them even by means of truly logical processes; it is

by means of their inconsistency (and lack of evidence) that the untruthfulness of various dogmas is proved, *i.e.*, they lead to manifestly false conclusions; for instance, if we apply logical processes or reason to the belief in a resurrection of the body, it leads to the manifest untruth that the same particles of matter are in a number of different bodies and places at the same time; or if we apply it to the assertion that mind is universal and exists throughout all space, it necessarily follows that space is filled with nervous matter. We sometimes decide what a thing is by first ascertaining what it is not; we learn what is possible by determining first what is impossible; and we often ascertain what cannot be by finding what is, various theological dogmas are disposed of in this way, *i.e.*, by showing that they are either contradictory to, or inconsistent with, well verified natural truths; the dogma of transubstantiation is a notorious example of this.

All the materials for our reasoning in science are previously obtained by means of comparison from our mental possessions and the results of our experience; when we cannot compare, we cannot employ the essential means of reasoning. The fundamental basis of all reasoning is a perception either of identity or of difference, and the most simple cases of inference are those in which identities alone are concerned. The simplest rule of inference is, that so far as there exists real sameness or equality in two different objects or phenomena, that which is true of one may be safely affirmed of the other; and this rule applies not only to sameness of kind, but also to sameness of quantity, and to all identities whatever. Multitudes of existences, conditions, bodies and actions, are only made known to us by means of inference; time, space, and universal molecular motion are examples of this. When we meet with a fresh substance, action, property, or relation, we compare it in every possible way with that which appears to be most like it, and if it agrees with it in every respect, we conclude by an act of inference that it is the same. If also we previously know the origin of a particular action, substance, or body, and compare a new one with it and find the two perfectly alike, we conclude that their sources were alike; thus "the tree is known by its fruit" (St. Matthew, chapter xii). Just so far, and no farther, as two things are essentially alike or identical, may we draw similar inferences respecting them; but analogy is not necessarily identity. If red-hot coals will not burn the hands, hair, or clothes of certain individuals, as has been asserted (see p. 306), those individuals, their hands, hair, and clothes, must be essentially different from the hands, hair, and clothes of all ordinary persons.

As soon as we are able to infer we are enabled to predict, and in this way reason enables us to argue from the seen to the unseen, from the known to the unknown; to judge before an act is performed what the future effect of that act will be. Before we even see a thing we may safely predict that it cannot, and does not, possess contradictory properties or attributes; or produce, at different times, under exactly the same conditions, contradictory effects, and that all its properties, attributes, and

effects agree with the chief laws of Nature; and the more perfectly we understand those laws, the more surely and completely can we predict. We can conclude with a high degree of certainty that supernatural things do not exist (see section 4). It is by means of the great laws of Kepler and Newton that mathematicians are able to foretell, with certainty, astronomical events which will happen thousands of years hence, and to verify those which happened many ages ago. "It has become possible to predict, not simply that under given conditions two things will always be found together, but also how much of the one will be found with so much of the other. It has become possible to predict, not simply that this phenomenon will exist after that, but the exact period of time at the end of which it will occur, or the exact distance in space, or both" (H. Spencer, "Principles of Psychology," p. 434). Things which, by the power of inference, we know can be predicted with certainty, we often do not attempt to verify, because it is unnecessary, and in some cases we take every means in our power to prevent their verification; for instance, if we know that a certain course of conduct of ours is likely to produce injurious consequences, we carefully avoid making the experiment. As knowledge of great scientific principles extends, our power of prediction increases, and with it our wisdom and moral conduct. A prediction is usually an inference, and every successful verification of it is a proof of the absence of supernatural interference with human affairs; if the "sun stood still in the heavens," as it is asserted to have done, all the solar eclipses subsequent to that event would not have occurred at the predicted time.

Some persons think that an inference is less certain than a direct observation made by the senses, and make the depreciatory remark "it is only an inference," or think that they have disproved an inference by saying "I actually saw the thing happen," but we must remember that, provided the data are sound, an inference is often far more certain than direct observation by means of the senses, especially in abstruse or comprehensive phenomena, because it is a conclusion arrived at after correcting the observations of the senses by means of comparison and other intellectual processes; for instance, the eye tells us that the earth is not a sphere, and that the sun revolves round it, but the reasoning faculty has proved to us that it is nearly spherical and that it revolves round the sun. It is because the conclusions arrived at by careful reasoning are in many cases far more certain than those obtained by direct sensuous impressions, that reason is the basis of wisdom, the source of safety in cases of probability, and the best guide of life. In consequence, however, of the considerable amount of training required to form a logical mind, where there is one man who can reason correctly there are many who can observe and talk. Increase of facts only confuses a man who cannot reason, like a full meal disorders one who cannot digest; and although figures cannot lie they often confuse unmathematical minds. "Reason is the only faculty we have wherewith to judge concerning anything, even revelation itself" (Bishop Butler); it was human reason which decided what Gospels and

Epistles in the New Testament were "divine" and what were not, and what writings were apocryphal and inadmissible into the Old Testament; it is the casting vote of human intellects, and not the "Holy Ghost," which decides at Papal councils. According to Cardinal Newman, "Inference is by its nature and by its profession conditional and uncertain" ("A Grammar of Assent," 1870, p. 57); but an inference is only uncertain when its premises, *i.e.*, the data or evidence upon which it is based, are uncertain, or the logical process has not been correctly performed; many astronomical inferences are not uncertain. The same writer states:—"Theological reasoning professes to be sustained by a more than human power, and to be guaranteed by a more than human authority" (*ibid.*, p. 377); but this enormous assumption of "more than human power" has never been proved and is not likely to be; and it is an irrational profession because it is untrue.

"All men have eyes, but few have the gift of penetration" (Machiavelli). Inference helps us to discern the inner nature of things; with the aid of science and reason we look at things and see what in them lies; within the facts we see new general truths, and within general truths we see new facts. Tell the philosophic chemist what are the true atomic weights of the present known elementary substances, and he infers the existence of others yet unknown and predicts their chief properties. Give the astronomer the necessary data for his calculations, and he infers the existence of undiscovered worlds and predicts future celestial occurrences; the astronomer becomes the seer, "whose eyes behold not what is near, but only what is far away" (Longfellow). Tell the social philosopher the kind of company a man keeps, and he is enabled to inform you what is the probable moral character of the man. By the aid of scientific knowledge and inference we perceive the moving powers in all things; within the watch, the spring; within the steam-engine, the molecular motion of heat; within the dynamo, the lines of energy; within the electro-plater's vat, the processions of ions; within the child, the man; within the genius, the mental power of imagination and of combining ideas; within mental action, cerebral molecular motion. Everything tells by means of inference its own tale; the great promises of the company promoter and priest disclose the small performer; "methinks the gentleman doth profess too much" (Shakespeare). Inference says that wherever there is lack of fundamental knowledge there is usually large belief of untruths and a tendency to crime. By means of inference, in every act around we see the workings of energy, visions of futurity and what must come, the future possibility of what mankind may be. Great power of imagination is based upon high intellect and consciousness in the particular subject; and although a man may have high intellect without great imagination, he cannot have noble imagination with small intellect. By means of sound inference and imagination the musical genius conceives the harmonies of words and sounds; the artist perceives the unison of scene and colour;

the sculptor looks as it were into his block of marble and imagines the figure which it can yield :—

> "Some have eyes that see not;
> But in every block of marble
> I see a statue—see it as distinctly
> As if it stood before me shaped and perfect
> In attitude and action. I have only
> To hew away the stone walls that imprison
> The lovely apparition, and reveal it
> To other eyes as mine already see it."
>
> —"Michael Angelo," by *Longfellow*.

Notwithstanding, however, all that is said about the "nobility of intellect," the actions, characters, and future careers of nearly all persons are primarily determined more often by the simpler parts of their nervous system than by the more complex ones, more by their spinal cord and cerebellum; more by their instincts, passions, emotions, and desires, than by their cerebrum and intellect; men are animals first and reasonable beings afterwards, and this must be, because they have not the time to make every matter beforehand a question of sufficient thought. "Appetite is the very essence of man" (Spinoza); man is led by his feelings; and intellect usually follows, not precedes, desire; desire also frequently follows intellect in well-trained persons. Men sympathise with what they can feel; and appreciate what they can understand. What are termed the instincts, emotions, and desires, are automatic or spontaneous actions, and include the promptings of hunger, thirst, love of life, love of sex, love of one's children, sympathy, benevolence, love of others, etc. All these are blind, and have no foresight of consequences; but if it were not for these blind forces many men would not move at all, either to take care of themselves or of others. The more ignorant, untrained, unscientific or selfish the man the stronger usually is the stimulus necessary to make him improve; and nothing less than the fear of hell, or a promise of everlasting personal pleasure, will make some men move. Whilst physical excitement is impetuous and less permanent, intellectual stimulus is less powerful but more lasting. As the body is the foundation of the mind, so the animal influences are the basis of the higher powers, and whilst the desires, emotions, and instincts can exist without intellect, intellect cannot exist without them; for without the promptings of desire, men would, in many cases, die before they could determine what they should do. "The stomach has more rights than the brain, for it is the stomach which sustains the whole organism" (Peter Kropotkine, "Expropriation," p. 1). The purely physical sensations, emotions, and animal desires, together with the instincts, stimulate us to preserve our lives, to propagate the species, and to perform the simplest kinds of industry. As the feelings do not think, so the thinking power or intellect does not feel. Emotion is a nervous action more than a mental one. The whole of our voluntary, and

some of our automatic actions, require to be controlled by reason based upon knowledge. The brain behaves towards a portion of the organism largely as if the latter was a separate person, over whom it possesses some degree of power and direction; the same power, however, is possessed in greater or less degree by every one part of the organism over the others. Just as the brain is the proper regulator of the muscles, so is the intellect that of the emotions and desires; it is more truthful to speak of ungoverned animal passions and desires as being "brutish" than to call reason and intellect "bitter" and "cold," because animals are more governed by desire and less by intellect than men. Reason is only "cold" to those who possess but little of it; to intelligent persons it is the great guide of life.

Similar to there being continuous physical actions of the organism in general, non-cognisant by the senses, such as circulation of the blood, digestion, growth, etc., so are there also continuous sub-conscious cerebral and mental ones, the existence of which are only made known to us by means of intellectual methods. Like as there are automatic physical actions not under the control of volition, so also are there automatic mental ones which are not governed by the intellect; irrational prejudice is one of these. Such unconscious cerebral actions may be regarded as instinctive.

"Instinct is a propensity prior to experience and independent of instruction" (Paley); it results from previous fitness of structure for action, and, like a steam-engine ready to start, its power is manifested as soon as it is excited and all obstacles to it are removed; it is often very similar in appearance to reasoning power, and the line of separation between the two cannot be clearly defined. Were it not that by conventional usage the term instinct is confined to the actions of living things, it might be applied to inanimate ones, such as a steam-engine under pressure of steam, which moves as long as the valve is open. It is a spontaneous tendency to action, and may be regarded as a complex form of reflex nervous action intermediate between purely animal action and intellect; it is co-extensive with animal life, and its rudiments may be traced downwards through vegetable life into the phenomena exhibited by minerals. A well-known physician has described it as "inherent in the primordial cell of every organism, whether it be animal or vegetable; and in all the tissues which are developed out of it; there is an intelligent power or agent, which, acting in all cases independently of the consciousness of the organism, and whether the latter be endowed with consciousness or not, forms matter into machines and machinery of the most singular complexity, with the most exquisite skill, and of the most wondrous beauty, for a fixed, manifest, and predetermined object—namely, the preservation and welfare of the individual and the continuance of the species. This *quasi*-intelligent agent works with an apparently perfect knowledge of number, geometry, mathematics, and of the properties of matter as known to the human intellect under the term of 'natural philosophy' or physics—that is to say, with a perfect knowledge of chemistry, electricity, magnetism, mechanics,

hydraulics, optics, accoustics—but as far transcending the limited knowledge of the human intellect as the structure and adaptations of living organisms exceed in beauty and fitness the most finished works of man. . . . I take it as an established principle that this *quasi*-intelligent agent which operates in the construction of organisms directs the use of the organs constructed" (Dr. Laycock, in an article on the Brain, *British and Foreign Medico-chirurgical Review*, July, 1855). This description is an excellent illustration of the fact that the human mind is very easily deceived by the appearance of intellect where no intellect operates; that the inanimate powers of material substances, acting according to rigid mechanical laws, often produce effects which have all the appearance of being directed by intelligence, when no cerebrum or other real intellectual apparatus is present; thus, speaking of a ship, it has been said—"she walked the waters as a thing of life." In a similar manner the human mind is led to the erroneous conclusion that the whole of the phenomena of the universe are directed by an infinite intelligence; the true conclusion being that they are solely the results of molecular and molar movements acting in accordance with a perfect system of laws. "Instinct is not a thing, power, or faculty, but only a mode of action common to all classes of mental aptitudes," and "may have been either congenital or acquired" (W. L. Lindsay, M.D., "Mind in the Lower Animals," 1879, vol. i, pp. 129, 130). As an illustration of instinct and intellect, it has been stated that "a collie dog found its way home from Calcutta by ship to Dundee, and then by another ship to Inverkeithing" (*ibid.*, p. 144). Instinctive action, provided it is correct, is in some respects superior to intellectual action, because it operates spontaneously and requires no effort, but it is nevertheless attended by expenditure of energy and waste of structure. Instinct guides only bodily needs (M. Dorman, "From Matter to Mind," 1895, p. 206). Many human actions, including all the automatic ones, do not arise from mental sources at all, but are determined by internal or external stimulants, volitional attention is not required for every breath or every footstep, but only occasionally to guide and correct. Our passions, instincts, emotions, and internal promptings, are frequently excited by our viscera, and often determine our actions for us without our perceiving it; but without them we should sometimes neglect the preservation of our lives and the perpetuation of our species:—

> "Reason, however able, cool at best,
> Cares not for service, or but serves when pre
> Stays till we call, and then not often near,
> But ready Instinct comes a volunteer."
>
> —*Pope.*

> "On life's vast ocean diversely we sail,
> Reason the card, but passion is the gale."
>
> —*Ibid.*

The conflict of feeling and reason, of desire and duty, is a very common circumstance, and is capable of being physiologically and psychologically explained; it is produced by two opposite and conflicting causes, viz., the physiological excitement of the organs of sensation on the one hand, and the idea of what is right on the other. The preponderance of desire over duty is usually much greater in ignorant than in intelligent persons, in young persons than in old ones, in unscientific persons than in philosophers, chiefly because the former prefer present pleasure to greater future happiness. If the feelings have been made too strong by having been gratified too much, they overpower the intellect, "the horse runs away with its rider"; but if the intellect has been sufficiently trained, it controls the feelings. We often desire what is forbidden, because restraint excites opposition.

> "The mind's the standard of the man."
>
> —*Dr. Watts.*

> "Who reigns within himself and rules
> Passions, desires, and fears, is more than king."
>
> —*Milton.*

In gratifying their chief animal desires, such as those for food, a dwelling, bodily exercise, love of offspring, change, etc., both men and women are very much like the beasts of the field; *i.e.*, they blindly respond to physical impressions, they act automatically, often without knowledge, forethought, or wisdom; and if they did not they would in many cases neither preserve their own lives nor those of their children, and the human race would die out, because life is too short to enable all men to investigate everything previous to acting. But whilst the chief feelings of mankind are essentially the same as those of other high grade animals, the influence of man's intellect is much stronger than theirs in consequence of hereditary influence and of having been more fully trained and developed.

The conflict between feeling and reason, duty and desire, is indirectly influenced by time; human beings are usually much more strongly influenced by ideas of the immediate consequences of their acts than by those of remote ones; and hence they often sacrifice reason and duty to immediate gratification of desire. If, however, all men and women were allowed to immediately have all they blindly want, irrespective of future events, nearly all persons would become selfish, and the human race would decay. The great reason why mankind suffers so much misery is because most persons prefer that which is immediately pleasant to that which is best, and only perceive their mistake when it is too late. The evil effects of preferring selfish desire to duty, and false ideas to true ones are so numerous and great, that we need sanitary rules enforced for the health of our minds nearly as much as for that of our bodies. "All history is full of evidence that ignorant minds yield at once to the force of sensual impressions." . . . "Hence, also, every species of violent emotion is

irresistibly propagated amongst the ignorant; for insanity and the most obstinate forms of nervous disorder thus become epidemic; and like the swine possessed by the legions of demons, those who are not fortified by truth rush one after another over the precipice to destruction" (G. Moore, M.D., "Power of the Soul over the Body," 1846, pp. 281, 282). "Every strong passion is *pro tanto* a passing madness" (Maudsley, "Natural Causes," etc., 3rd edition, 1897, p. 173).

> "Self-love and reason to one end aspire,
> Pain their aversion, pleasure their desire."
>
> —*Pope.*

There is a very important difference between the mind of a man and that of a woman; women's ideas are usually smaller than those of men. "Women do not naturally accumulate accurate knowledge. Left to themselves, they accept various kinds of teaching, but they do not by any analysis of their own either put that teaching to any serious intellectual test, or qualify themselves for any extension of it by independent and original discovery." "The absence of the investigating and discovering tendencies in women is confirmed by the extreme rarity of inventions due to women even in the things which most interest and concern them. . . . The stocking-loom and the sewing-machine are both of them masculine ideas carried out to practical efficiency by masculine energy and perseverance. So I believe that all the improvements in pianos are due to men, though women have used pianos much more than men have used them" (Hamerton, "The Intellectual Life," p. 243 *et seq.*). With a very small proportion of exceptions, all the great discoveries in science, and their applications to human progress in inventions, arts, and manufactures, in sewing machines, cycles, musical instruments, improved dwellings, clothing, etc., etc., have been made by men alone; but the scientific education of women will probably alter this in the future. The almost entire absence of great female composers of music is equally conspicuous; and the whole of this may be summed up in the words—deficiency of power of originating or evolving knowledge; so that if it had not been for the original mental thought and labour of men, there would have been scarcely any progress in civilisation. According to Hazlitt, there has been no great female poet or philosopher ("Thoughts and Maxims," p. 114). Women, however, keep the human race alive, and will probably in the future, by their great sympathy and refinement of feeling, crown the great edifice of human knowledge by altruism, goodness, and universal affection. Lord Bacon said that a wife and family are impediments to originality and to great undertakings; but this is only an illustration of the more general truth that lesser intellect usually hinders greater intelligence and the most comprehensive altruism.

Notwithstanding that women live in the same world as men, that their happiness is as much dependent upon their environment and personal

improvement, and that they have as much time to think as men, yet they do not evolve as many valuable original ideas. The scientific explanation of this is: (1) Such ideas can only be evolved by meditation, guided by knowledge of great scientific truths and laws; (2) women do not usually possess such knowledge, their minds are commonly filled with smaller ideas; (3) very few of them practise the art of reasoning upon comprehensive questions; and (4) valuable original ideas are not usually obtainable from thoughts about the subjects which commonly occupy women's minds. There appears, however, to be no real or insuperable reason why women may not make important discoveries and inventions, compose high-class music, etc., if they adopt the usual methods; and they probably will do so as their scientific knowledge extends. A similar, though smaller, deficiency of power of originating great fundamental truths due to want of scientific knowledge has been attributed to ecclesiastics, and will probably be removed by similar means. The following are the names of the most notable scientific women:—Sophie Kowalevski, Professor of Mathematics in Stockholm; Sophie Germain, a "highly gifted mathematician"; Mrs. Somerville, also a mathematician; Marie Agnesi, nominated Professor of Mathematics in the University of Bologna by Pope Benedict XIV; Laurè Bassi, teacher of physics; Therèse Manfredi and Madeleine Manfredi, both astronomers; Miss Herschel, also an astronomer, who, under the guidance of her brother, discovered several comets (A. Rebière, "Les Femmes dans la Science"; *Nature*, vol. 50, p. 279, July 19, 1894, and April 8, 1897, p. 543).

That intellect is possessed by several other animals besides man has been concluded by many observers who have carefully examined and considered the subject. There are rudiments of human mental habits in many animals; every dog can distinguish his species from all others; many dogs do to a certain extent venerate and worship men as a kind of god to them; prairie dogs form cities, sometimes as large as thirty English miles in diameter, and containing 100,000 dogs (Büchner). Whilst nearly all animals exercise the lower intellectual faculties of perception and observation, a much smaller number employ the higher ones of attention and comparison, and a comparatively few possess the power of inference, but none are equal to man in their degree of reasoning power or in carrying on long-continued trains of thought. Amongst the most intelligent of animals are usually classed the monkey, dog, elephant, horse, and seal. It has been found by actual trial that crows can count numbers up to four or five. "Many animals improve by experience, though in a much less degree than man" (Sir B. Brodie). Old ones are often more cautious than young ones; an old fox suspects snares, and avoids them; many facts of a similar kind, and the capability of improvement in animals by training, fully prove the possibility of evolution, progress, and civilisation in other animals besides man. Nearly all animals resist being robbed, they store up property, but do very little in the way of barter.

Ants have great intelligence. "One day a silk-grower noticed that the

ants, which were very partial to his silkworms, climbed up a mulberry tree and annoyed the caterpillars until they let go their hold and fell to the ground, when an army of carriers lost no time in bearing them away. To put an end to this raiding, the observer (Mr. F. Beeson) made a ring of bird-lime on the trunk of the tree, and for four days the barrier proved impassable. On the fifth day an engineer appeared on the scene. An ant brought a large grain of sand in its jaws, placed it on the bird-lime, and then went down again. The other ants came and examined in turn this embryo bridge, descended, and, after about ten minutes, every ant that came up brought his grain of sand. At the end of half-an-hour the bridge reached right across the bird-lime, and was wide enough for four ants to march abreast. The observer had not the heart to destroy their work, and rewarded their intelligence by abandoning the mulberry tree to them" (M. Dorman, "From Matter to Mind," 1895, pp. 161-162).

Monkeys are very fond of imitating, and this peculiarity is used as the basis of a method of catching them. The natives wash themselves with water in sight of them, then replace the water by liquid glue, and decamp out of sight; the monkeys imitate the washing process; their eyelids become glued together, and they are then easily caught (C. J. Hardy, "The Business of Life," 1891, p. 249).

That man is not the only intelligent animal is illustrated by the following description by Dr. Romanes of the behaviour of a monkey belonging to him:—"To-day he obtained possession of a hearth-brush. He soon found the way to unscrew the handle, and, having done that, he immediately began to try to find out the way to screw it in again. This in time he accomplished. At first he put the wrong end of the handle into the hole, but turned it round and round the right way for screwing. Finding it did not hold, he turned the other end of the handle and carefully stuck it into the hole, and began again to turn it the right way. It was, of course, a very difficult feat for him to perform, for he required both his hands to hold the handle in the proper position, and to turn it between his hands in order to screw it in, and the long bristles of the brush prevented it from remaining steady or with the right side up. He held the brush with his hind hand, but even so it was very difficult for him to get the first turn of the screw to fit into the thread; he worked at it, however, with the most unwearying perseverance until he got the first thread of the screw to catch, and he then quickly turned it round and round until it was screwed up to the end. The most remarkable thing was that, however often he was disappointed, he never was induced to turn the handle the wrong way; he always screwed it from right to left. As soon as he had accomplished his wish he unscrewed it again, and then screwed it again, the second rather more easily than the first, and so on many times. When he had become by practice tolerably perfect in screwing and unscrewing, he gave it up, and took to some other amusements." "He has also unscrewed all the knobs that belong to the fender. The bell-handle beside the mantelpiece he likewise took to bits, which involves the unscrewing of three

screws" ("Animal Intelligence," p. 490). Numerous examples of a similar kind are given in "Mind in the Lower Animals," by Lindsay; "Mind in Animals," by Büchner; "The Brain as an Organ of Mind," 1890, by H. C. Bastian, F.R.S., and in other books. In direct proportion to the degree of complexity of an animal, and especially of its brain, from the lowest creature up to man, and from that of a baby up to a full-grown man, does the degree of intelligence usually increase.

"Managers of menageries and employers at the various zoological gardens know that the elephants under their care are prepared to go on a wild drunk whenever opportunity offers . . . Bears and monkeys drink beer like German students, and love whisky equally well. In Africa the natives make use of this evil trait to capture their poor relations. The monkeys there are extremely fond of a beer brewed by the natives. So the latter place quantities of the liquor within easy reach of the monkeys, and wait until their victims are thoroughly befuddled. In this state they are unable to recognise between negro and ape. When the negro takes the hand of one of them, a second monkey takes the hand of the first, a third that of the second, and so on. A single negro may sometimes be seen carrying off a string of staggering monkeys" (Quotation, *Review of Reviews*, May, 1898, p. 473). "Dogs will take brandy until they have *delirium tremens*" (*ibid.*); other instances are quoted of intoxicated fowls; a parrot, a crow, a screech owl, and a drunken fish. A number of instances of the effect of music on animals are quoted in the same periodical, p. 475, from Mr. Cornish's "Orpheus at the Zoo," showing that the monitor lizard, snakes, cobras, the Polar bear, the common wolf, the elephant, tiger, and the ostrich were much affected by the sounds from the piccolo, the violin, and the flute; and that the two latter, which "human taste has approved as the most pleasing of instruments, are most acceptable to the brute creation." "No creature seemed wholly indifferent to the charm of music, except the seals; while to all a discord was offensive." "The tiger started up in fury at the first shrill cry of the piccolo." For the effects of music on animals, see an article by G. Bolton, in *Pearson's Magazine*, February, 1899, p. 205. As an example of intelligence in animals, Prince Maurice once related to John Locke that whilst in Brazil a very large and old parrot, when brought "first into a room where the prince was with a great many Dutchmen about him, it said presently, 'What a company of white men are here!' They asked it what it thought that man was? pointing to the prince. It answered, 'Some general or other.' When they brought it close to him, he asked it, 'Whence came you?' It answered, 'From Marinnan!' (Maranham?). The prince, 'To whom do you belong?' 'To a Portuguese.' Prince, 'What do you do there?' The parrot, 'I look after the chickens!' The prince laughed, and said, 'You look after the chickens?' The parrot answered, 'Yes, I; and I know well enough how to do it; and make the chuck four or five times that people use to make to chickens when they call them.'"

"There has always existed a tendency in man to overrate his own

mental powers and qualities in relation to, or in contrast with, those o other animals" (W. L. Lindsay, M.D., "Mind in the Lower Animals," 1879, vol. i, p. 118); and this has been recognised in the Scripture precept, "Go to the ant thou sluggard, learn his ways and be wise." "Operations that in man are ascribed to reason, are in other animals, on no proper grounds, ascribed to instinct" (*ibid.*, p. 126). According to the same investigator, individual animals, just like individual men, can only learn certain things, "we cannot teach an old dog new tricks"; horses, cows, camels, mules, chimpansees, giraffes, and sea bears weep; animals make frequent mistakes and experience many failures, like men; some animals become diseased by over-eating (*ibid.*, pp. 236, 324, 502, 510). Rats, jackdaws, ravens, cats, and other animals steal and hoard bright articles; a great variety of animals are fond of intoxicating liquors; dogs, cats, horses, parrots, canaries, bullfinches, etc., dream; some animals walk in their sleep; others have nightmare; various animals, for instance, dogs, monkeys, cats, elephants, and others, commit suicide; and the crimes and artful contrivances of animals are substantially similar to those of men. Gorged serpents may be safely handled (*ibid.*, vol. ii, pp. 55, 81, 92, 94, 97, 98, 133, 141, 148, 209). "Intelligence begins at the very bottom of the zoological scale" (*ibid.*, vol. i, p. 63). Or to sum up all these statements, we may say that wherever there is living nerve-substance there also are its properties, whether in a man or in any other living creature.

Having shown that by the aid of observation and scientific research we have gradually become more and more able to perceive the mutual dependence of the human body and mind, I leave my readers to judge whether "The relation between the body and mind is totally incomprehensible" (J. J. Murphy, "Scientific Bases of Faith," 1873, p. 140).

45. "Immortality of the Soul."

The terms, human mind, soul, and spirit, may be treated as being synonymous. "By the spirit we mean only that which thinks, wills, and perceives" (Berkeley, "Principles of Human Knowledge"). As the human mind is most intimately dependent upon the chief nerve-centre, and upon cerebral chemical action (section 44), the question of the "immortality of the soul," or mind belongs to the domain of science. In section 44 it is stated that no reliable and fully verified signs of mind have ever been detected apart from nervous tissue, and therefore it is not a separate entity, but (somewhat like magnetism in iron) it is an action of the substance in which it is observed. As the magnetic capacity of iron disappears whilst the iron is red hot, and reappears on cooling, so the conscious mental condition of brain is suspended during sleep, and is renewed on waking. As also the magnetism disappears on dissolving the iron in certain acids, and does not (with some slight exceptions) reappear

in the new chemical compounds formed, so the mind disappears at death, and does not reappear in the material products of decay, nor have we any reliable and fully verified evidence that it still exists in space. Further, if we extract metallic iron from the aforesaid chemical compounds, and restore it to its original state, the magnetic capacity reappears; and similarly if from earth food is produced, and from the food human brain is formed, it exhibits the phenomena of mind. "By no kind of evidence can it be proved that the soul exists, whether in man or other animals" (W. L. Lindsay, M.D., "Mind in the Lower Animals," 1879, vol. i, p. 101). According to H. Drummond, "The soul is a living organism"! ("Natural Law in the Spiritual World," 1888, p. 239). "The soul is in the whole body, in every part of it, in every nerve" (J. D. Morell, "Elements of Psychology," 1853, part i, p. 76). Quite 5000 books have been written respecting the human soul (Alger, "Theories of a Future Life"), and have left "confusion worse confounded." The following lines illustrate the ordinary obscurity of thought upon this subject :—

"Musicians think our souls are harmonies;
Physicians hold that they complexions be;
Epicures make them swarms of atomies
Which do by chance into our bodies flee.

"One thinks the soul is air; another fire;
Another blood diffused about the heart,
Another saith the elements conspire,
And to her essence each doth yield a part.

"Some think one general soul fills every brain
As the bright sun sheds light in every star;
Another thinks the name of soul is vain,
And that we only well-mixed bodies are."

—*Sir J. Davies*, "Immortality of the Soul."

According to Ulrici, the soul is "an invisible enswathment of the body, material yet nonatomic"; according to Wundt, it is "the ordered unity of many elements" (H. Drummond, "Natural Law in the Spiritual World," 1888, pp. 225, 226). Another writer speaks of a man as "being an aggregate of millions of souls and bodies"; and says "in each and every individual cell or 'body' there exists a 'life'—a 'soul'" (A. J. Bell, "Why does Man Exist?" 1890, p. 246). If a soul really exists, persons who are afflicted with "double consciousness" must have two souls, one of self and one of second self; and if there was as large a proportion of conscious nerve-substance in the heart or liver, as there is in the brain, many persons would be led to believe in the existence of a soul in each of those organs. "Man has a soul, that is, he is made to know God" (A. Moore, "Science and the Faith," 1889, p. 24). "The New Testament affirms with a clearness previously unknown the immortality of the soul" (Bishop Temple, "The Relations between Religion and Science," 1885, p. 149); but this is

affirmation without proof, and the New Testament is a very weak authority in such a question. Whilst there are many millions of persons who believe in "immortality of the soul," there are also many millions who do not, but either of these facts is very weak evidence of truth or falsity in such a subject, because the question is beyond the clear understanding of the great mass of mankind.

According to the late T. H. Huxley, a highly competent person to speak on the subject: "In the interest of scientific clearness, I object to say that I have a soul, when I mean all the while that my organism has certain mental faculties, which, like the rest, are dependent upon its chemical composition, and come to an end when I die; and I object still more to affirm that I look to a future life, when all that I mean is that the influence of my sayings and doings will be more or less felt by a number of people after the physical components of my organism are scattered to the four winds" (*The Open Court*, No. 424, p. 4665). "Unprejudiced philosophy is compelled to reject the idea of an individual immortality and of a personal continuance after death. With the decay and dissolution of its material substratum, through which alone it has acquired a conscious existence and become a person, and upon which it was dependent, the spirit must cease to exist" (Büchner, "Force and Matter," 1884, 3rd edition, p. 232).

According to theological views, the importance of "the human soul" is so immense that "nothing is equal to it," and the Church may take most extreme measures in order to bring all men into its fold and ensure their "salvation," and this is not only true of the Romish, but also of some other churches. "The immeasurable value of the human soul" (Rev. J. P. Hopps, "The Future Life," p. 18; "Modern Handbooks of Religion"). "The office of the" (Catholic) "Church is to become all things to all men that she may save all" (W. S. Lilly, "Ancient Religion and Modern Thought," 1896, p. 286); "to watch for men's souls, not to unsettle their faith" (*ibid.*, p. 278). Truth in such a case is largely disregarded; thus the Church may assert as truths the most unprovable dogmas; it may proclaim itself infallible in faith and morals; it may publish or countenance as facts the occurrence of "miracles," "25,000 of which were announced between the fifth and fifteenth centuries"; it may affirm that it possesses direct revelations from an infinite Deity; it may practise these and every other "pious fraud" which it feels necessary for the "salvation of souls," limited by the capacity of unscientific persons to be deceived by them; and all this, within certain limits, is necessary and in obedience to the energies and laws of the universe; it has happened, and will doubtless continue to happen, and is a part of the great scientific drama of the evolution of mankind. But it is equally a part of that drama, and equally consistent with omnipotent energy and immutable law, for men of science to place the scientific aspect of the universe and of human affairs before their fellow-men; to thus diminish the influence of ignorance and error; and to assist the progress of truth. Mankind have quite

sufficient to think of and be anxious about in this life without worrying themselves about an imaginary future one.

It is constantly being asserted by many persons that the human mind is an "intangible spirit"; if this is true it can neither directly touch nor be touched by any material substance nor indirectly through the universal ether; nor render itself manifest through the human body or brain; and if it cannot be touched it cannot be injured, but as we know that it is destroyed by a blow on the head it is evident that it is not an intangible spirit.

Gases were formerly considered to be spirits, partly because of the more common belief in mysterious existences, and partly because they cannot be grasped or seen, the vapours of alcohol, and other volatile liquids, are still called "geists" or ghosts in the German language and "spirits" in English; and now the phenomena of the universal ether, like those of gases in former times, are employed by spiritualists as evidence of occult actions of spirits in the air; but although the ether cannot be seen or handled, its actions as far as we know are neither spiritual nor supernatural. Dr. A. R. Wallace states that "spirit is mind," and "at death quits the body for ever," and carries its individuality and personal peculiarities into a future state of existence, and goes on increasing in knowledge ("Miracles and Spiritualism," 1896, pp. 107, 115). He also states that "the doctrine of a future state is to be found in the works of all spiritualists" (*ibid.*, p. 227); that he is a believer in various kinds of spirits, and that some of them act upon our bodies, and upon our material substance, and some upon our minds (*ibid.*, p. vii). He further says that by some subtle forces, of the nature of which the physicist is wholly ignorant (*ibid.*, p. 151), tables, chairs, drums, human beings, etc., etc., have been enabled to float in the air, that persons have carried red-hot coals in their hands, upon their heads, and in their pockets, without their hands, their hair, or their clothes having been burned; that drumsticks have beat drums in the air without any visible cause or support; and many other strange phenomena (*ibid.*, pp. 150, 166); and that spiritualism "furnishes actual knowledge in a matter of vital importance to all men" (*ibid.*, p. 220). If these statements of the suspension of the attraction of gravitation, and of the inability of red-hot coals to burn, etc., are true, most important scientific researches might be based upon them. There would be abundant scope for experiments by trying all kinds of combustible substances, both of the burning ones and of those which are said to resist burning; all kinds of gases and liquids in which to immerse the red-hot coals; all kinds of screens to intercept the rays; all kinds of mirrors to reflect them; all kinds of prisms to decompose them, etc., etc.; and until it is proved in these or other reliable ways that the phenomena are real, experimental investigators will not readily believe such statements, nor risk their time, labour, or money, in testing them. There are always plenty of persons who are ready to make assertions and to challenge scientific men to test them; it would, however, be much more reasonable to expect those

who believe that red-hot coals will not burn a man's hands, his hair, or his clothes to properly investigate the subject than to expect scientific men to do it for them.

With regard to the fact that various men, eminent in some sections of science, have expressed their belief in the reality of the existence of spirits apart from the human body, we may remark that the ability of a man in one subject is but rarely a proof of his ability in another; we know that although Ampère was an eminent mathematician, he was also a devout believer in transubstantiation (Hamerton, "The Intellectual Life," 1875, p. 220); that Faraday was a great discoverer, and yet a believer in the doctrines of Sandeman; Volta, a Roman Catholic (A. Cortie). Spiritualists appear to be in a somewhat similar position now, that believers in witchcraft, miracles, and other occult agencies, were in former times. According to Sir E. Arnold: "Man is not by any means convinced as yet of his immortality. All the great religions have in concert, more or less positively, affirmed it to him; but no safe logic proves it; and no entirely accepted voice from some further world proclaims it" . . . "only a few feel quite certain that they will never cease to exist" ("Death and Afterwards," 1892, p. 9). According to W. Reade "man will never attain to his full power as a moral being until he has ceased to believe in the immortality of the soul" ("The Martyrdom of Man," 14th edition, 1892, p. 524). It certainly tends to injure a man's character for truthfulness to fixedly believe that he shall live for ever after death, because it is not a well-verified fact. Similar to the poor untaught North-American Indians and the natives of Madagascar, who thought that they were being robbed of parts of their souls when their portraits were being taken, so the genuine believer in eternal life considers that he is being deprived of real and inestimably precious possessions when he is informed that there exists no proper and sufficient evidence of the truth of his belief; and like "a drowning man clings to a straw," so is he compelled by the fixity of his impression and the strength of his desire to cling to his belief. When Mr. Catlin painted the portraits of some of the North-American Indians, the Mandans, he was charged with taking away "a part of the existence of those whom he painted" ("Smithsonian Reports," July, 1885, part ii, p. 725). Similarly, Dr. Catat and M. M. Maistre, when photographing the Royal Family in Madagascar, were charged with taking the souls of the natives to sell them in France (E. Clodd, "Pioneers of Evolution," 1897, pp. 222, 223. See also "Knocking Round the Rockies," by E. Ingersoll, p. 95). According to Archbishop Whately, "the question—What is true? ought to stand on the threshold of every religious inquiry," and "is the question to which all other questions should be postponed" ("Detached Thoughts and Apothegms," 1856, p. 9).

"Physiology decides definitely and categorically against immortality, as against any special existence of the soul. The soul does not enter the fœtus like the evil spirit into persons possessed, but is a product of the development of the brain, just as muscular activity is a product of

muscular development" (Vogt. quoted by H. Drummond, "Natural Law in the Spiritual World," 1888, p. 223). "On any theory it is not to be denied that the difficulties in the way of those who believe in a future life and a spiritual being are extreme" (W. R. Greg, "Enigmas of Life," 1889, p. 220). "The whole subject of immortality has its prime roots in personal feeling" (W. James, Professor of Psychology, "Human Immortality," 1898, p. 11). Belief in immortality is founded largely upon personal desire; those who wish to live after death continue to wish it and pay persons to persuade them to believe it, until they are themselves rendered incapable of believing otherwise. According to the statements of A. R. Wallace:—"The spiritualist not only believes, but often obtains direct evidence of the fact, that his dearest friends and relations, who have gone to the higher life, are anxiously watching his career, and themselves suffer whenever he gives way to temptation" ("Why Live a Moral Life," *The Agnostic Annual*, 1895, pp. 9, 10); according to this, the "spirits" must possess the powers of seeing without eyes, hearing without ears, feeling without nerves, etc., etc.

Many attempts have been made to find "the seat of the soul," and it has been suggested as being in the "pituitary body," the weight of which is only about "five to ten grains" (Quain), or in the "pineal gland"—"a reddish body of about the size of a small cherrystone" (*ibid.*); or in the "Lamina terminalis"; but it has never been found. Mind is an active condition of cerebral and ganglionic nervous matter, and not a spirit which resides in a particular spot, and which comes and goes when and where it pleases. If it exists after death, we may reasonably ask, where is it previous to birth? The history of the Christian religion, that of Roman Catholicism in particular, contains accounts of a number of cases in which it is seriously affirmed that the souls of pious persons temporarily left their bodies and returned to them again, in some of which they are said to have visited heaven and hell and seen most wonderful things (see "Dictionary of Miracles," by Dr. Brewer, p. 308, *et seq.*);—such cases are mentioned even in the New Testament; for instance, "I knew a man in Christ (whether in the body, or out of the body, I cannot tell), such a one caught up to the third heaven, and heard unspeakable words" (2 Cor. xii, 2-4). Nearly all such instances are cases of trance, or ecstasy, and happen most with those whose ignorance of the physiology of nervous substance is greatest. It is well-known to physiologists that in certain abnormal states of the brain and nervous system persons actually see things which do not really exist, and which other persons cannot see; and that in some cases they can, under suitable circumstances, repeat the phenomena by an effort of volition; the so-called "miracle" of "The Immaculate Conception" at Lourdes is a notorious example.

Shall a man dictate to omnipotent power as to when a new "eternal soul" shall be created? yet this dictation is a necessary inference, if the human soul is created in each infant and has a separate and eternal existence. It is only piling difficulty upon difficulty to follow out the

necessary consequences of a belief in immortality, and those who hold the belief have either never sufficiently considered those effects, or the belief is irremovably fixed in them. If all men, whether ignorant or wise, are to be "perfectly happy" in a future state of existence they must have perfect and unlimited faculties, and must be gods; but if they are still individual men they must differ in body and mind, and there must be conflict between them the same as upon this globe. "If we grant that a spirit has actually been seen, we must also admit that it has assumed a material form, capable of reflecting light upon the visual organ, or of actually radiating light as when seen in a dark room, yet of such tenuity as to be imperceptible to touch, and retaining a definite form when merely supported by surrounding air; that this material form was an exact model of the body of the deceased, which body may have been at the time completely decomposed and resolved into its primal elements; that this film and simulacrum, notwithstanding the extreme fineness of its physical qualities, has the power of producing vibrations in the air as strong, as definite, and articulate, as those which are occasioned by the complicated and strongly exerted vocal apparatus of full-grown man; and, moreover, bearing that peculiarity of intonation which identifies it with the voice of the departed, whence it appears that the simulacrum must have an internal construction; that is a larynx and fauces, corresponding like its external appearance with the organisation of the same corrupted body; and that, finally, seldom we hear of a ghost unprovided with the ordinary vestments; or, at least, the grave-clothes of the dead, we must allow that there may exist material spectra of garments, that have long ago mingled their dust with the ashes of their wearer, or been dispersed with the bodies of moths into almost every modification and regeneration of matter" (Dr. J. A. Symonds, "Miscellanies," 1871, p. 214). "The ghost of a departed individual is nothing more than his recollected image, so preternaturally vivified as to be mistaken for an external visible object; and, in like manner, his voice is only a collection of renewed impressions of sound, of an equal intensity with what they formerly possessed when produced by vibrations of air affecting the auditory nerve" (*ibid.*, p. 233). The Moslem prescription for seeing spirits is:—"Fast seven days in a lonely place, and take incense with you. Read a chapter 1001 times from the Koran. That is the secret, and you will see indescribable wonders; drums will be beaten beside you, and flags hoisted over your head, and you will see spirits" (E. Clodd, "Pioneers of Evolution," 1897, p. 136). As such a combination of conditions would be quite sufficient to make any ordinary person temporarily insane, and liable to perceive extraordinary subjective phenomena, it would render his evidence valueless, and it agrees with physiological facts and with the statement that "a hazy, muzzy state of mind" is favourable to obtaining "evidence" of the existence of spirits in space.

It is a conspicuous circumstance that amongst the extremely numerous and reckless assertions made respecting "immortality of the soul," there are none proving the mode of life, or the conditions of existence, of the

countless myriads of souls of human beings who have died in all past ages, or where they are, nor by what means they have subsisted, nor how they have occupied their time, nor what good they have done during those vast periods; but as the doctrine is a dubious one, believers in it are recommended to "let it rest in the vague if they would have it rest unshaken" (W. R. Greg, "Enigmas of Life," 1889, p. ix). Even those who profess to believe it are, by the operation of irresistible natural causes, frequently compelled to act as if they did not, for in many instances we know by their expressed statements that their minds are afflicted and torn by uncertainty and doubt respecting it, which in not a few cases has terminated in insanity. For what proper and sufficient reason should man alone, out of about 360,000 different kinds of animals, live for ever after death? He is not the only creature possessing feeling, sympathy, affection, and memory. His mental differences from theirs are not ones of kind but only of degree; his only superiority consists in his greater powers of intellect. There exists plenty of evidence to prove that other animals equal and even excel him in most of the humbler mental powers and social virtues. (Consult "Mind in the Lower Animals," 1879, by W. Lander Lindsay, M.D.)

An invisible or "unseen universe," and a future life of "the spirits of dead men made perfect," are two very different things; we have plenty of evidence of the existence of the former but not that of the latter. Science has enabled us to indirectly feel the intangible, hear the inaudible, and perceive the invisible; it has fully proved the existence of multitudes of actions which the eye of man has not seen, the ear has not heard, and the hand has not grasped. A conspicuous example of this is the telegraphing without wires, in which invisible, inaudible, and intangible vibrations, of a frequency of about 250 millions per second, are transmitted through space at a velocity of about 186,400 miles per second, and produce visible, audible, and tangible effects at a distance of many miles from their source. But whilst we have thus obtained abundant evidence of the existence of an unseen universe of invisible vibrations, we have no proper and sufficient evidence that there exist solemn crowds or cavalcades of spirits of dead men existing in space. Although many thousands of millions of human beings have died upon this globe ("15,000 millions in 50 centuries" S. Laing; 200,000 millions in 100 generations of 30 years each, Babbage), and that in many cases persons just before death have promised to do so, "not to one of all the unnumbered generations whose dust is blown upon the desert winds has it been permitted to breathe one syllable or letter of the dim and awful secret beyond the grave" (F. W. Farrar, "Words of Faith and Wisdom," 2nd edition, p. 130). Further, the spirits could not possess the powers of living creatures, such as flying, seeing, hearing, talking, singing, etc., attributed to them, unless they possessed the necessary bodily organs, and a supply of food and energy; mind alone does not create energy, it only liberates it from material substances. A multitude of reasonable questions might be asked respecting these spirits, not one of which could

be satisfactorily answered. To tell persons that they "will live for ever" in a state of eternal bliss is a species of fortune-telling, and perfectly safe to the fortune-teller, because the practical test of it only comes after death, but there are many persons who, similar to children, are not satisfied until they are promised what cannot be fulfilled. The facts may also be mentioned that no persons sufficiently believe it as to induce them to commit suicide in order to obtain immediate and everlasting happiness, and that if a man killed another in order to relieve him of a life of misery here, and secure to him a future one of eternal joy, he would be treated either as a lunatic or as a murderer, even by those who profess to believe in and teach the doctrine. The question has been asked: "What shall it profit a man to gain the whole world and lose his own soul?" and we may with equal propriety ask: What shall it profit a man to be told or believe that he shall receive a thousand million pounds sterling if he has no proof that he will ever receive it? It has one effect; it cruelly makes him the victim of painful anxiety, of conflicting desires and apprehensions, unable to compose his mind upon a most important question until it is verified, and liable to become insane respecting it. The pleasure we feel in being informed that a great fortune has been left to us is no proof whatever that the statement is true; and it is similar with all unprovable assertions and promises of eternal happiness. "The desire of a future existence is merely a pampered habit of mind, founded upon the instinct of self-preservation. It is a longing, and those who have it are like drinkers or children" (Atkinson and Martineau, "Man's Nature," etc., 1851, p. 185). The desire to obtain something for nothing is as great in the saint as in the sinner, in the Salvationists as in the betting and gambling fraternity. Similarly to the alchemists who, in the sixteenth century knew that chloride of silver was darkened by light, but neglected the substance for the shadow by turning their attention away from the development of photography by their selfish search for the philosopher's stone with which to convert base metal into gold; so do sectarian believers at the present time neglect the solid truths of science in order to pursue the ever-retreating phantom of eternal happiness.

The desire for immortality is a vice, because it habituates the human mind to fixedly believe important ideas without proper and sufficient evidence, and it is frequently associated with irrational dissatisfaction with this life. "There are many people who are not satisfied with this state of things. They dream of a paradise where there is no strife, no war, no conflict; where there is eternal peace, unmixed happiness, joy without pain, and life without struggle. Whenever you try to depict in your imagination such a condition of things, you will find that a world of eternal peace is an impossibility" (*The Open Court*, No. 133, p. 2137). According to some persons, immortal life "must be a new creation—a new result of the same Power that created the world of matter" (J. J. Murphy, "Scientific Bases of Faith," 1873, p. 288)—thus, all who die, amounting to about 86,000 daily, are, according to this view, recreated! "Immortality means personal

immortality, or it means nothing" (A. L. Moore, "Science and the Faith," 1889, p. 154). Speaking of a belief in immortality:—"Accepted not as a first choice, its value has invariably been associated with extravagant and unwholesome joys or with terrible fears. This has enabled the priest to take as his favourite stand the threshold of undying existence, and by pictures of bliss and pictures of misery to buy the services of his hearers or terrify them into submission" (E. P. Powell, *The Open Court*, No. 420, p. 4631). "Man hopes and longs for a revelation of Divine justice and mercy, and can be satisfied with nothing short of their perfect fulfilment" (J. J. Murphy, "Scientific Bases of Faith," 1873, p. 419); as if this life was not really one of justice or happiness to those who fulfil their duties in it. The true hereafter is the future state of greater knowledge, greater goodness, greater peace, lesser conflict in this life, when:—

> "For evermore, for evermore
> The reign of violence is o'er."
> —*Longfellow.*

The ordinary theological idea of "immortality of the soul" is either that of "eternal torment in hell," or that of being "happy for ever and ever in heaven." As an example of the cruel use made of the former, I insert the following extract from "Enigmas of Life," by W. R. Greg, 1889, pp. 251-253):—"I have now lying before me a book, entitled 'A Sight of Hell,' professing to come from the Rev. Father Furniss, C.SS.R., and printed 'permissu superiorum,' and recommended to be used along with the Catechism in Sunday schools as a part of a course of religious instruction. It is one of a series of 'Books for children and young persons.' 'Little child, if you go to hell there will be a devil at your side to strike you. He will go on striking you every minute for ever and ever without stopping. The first stroke will make your body as bad as the body of Job, covered from head to foot with sores and ulcers. The second stroke will make your body twice as bad as the body of Job. The third stroke will make your body three times as bad as the body of Job. The fourth stroke will make your body four times as bad as the body of Job. How, then, will your body be after the devil has been striking it every moment for a hundred millions of years without stopping?' Next comes 'A Dress of Fire.' (Job xxxviii), 'Are not thy garments hot? Come into this room. You see it is very small. But see in the midst of it there is a girl, perhaps, about eighteen years old. What a terrible dress she has on; her dress is made of fire! On her head she wears a bonnet of fire. It is pressed down all over her head; it burns her head; it burns into the skin; it scorches the bone of the skull and makes it smoke. The red-hot fiery heat goes into her brain and melts it. (Ezekiel xxii), I will burn you in the fire of my wrath; you shall be melted in the midst thereof as silver is melted in the fire. You do not, perhaps, like a headache. Think what a headache that girl must have. But see more. She is wrapped up in flames, for her frock is on

fire. If she were on earth she would be burned to a cinder in a moment. But she is in hell where fire burns everything, but burns nothing away. There she stands burning and scorched; there she will stand for ever burning and scorched. She counts with her fingers the moments as they pass away slowly, for each moment seems to her like a hundred years. As she counts the moments she remembers that she will have to count them for ever and ever.' The children are then favoured with the sight of a boiling boy. 'But listen, there is a sound like that of a kettle boiling. Is it really a kettle which is boiling? No. Then what is it? Hear what it is. The blood is boiling in the scalded veins of that boy. The brain is boiling and bubbling in his head. The marrow is boiling in his bones.' They also have a peep at a baby in a red-hot oven. 'Hear how it screams to come out. See how it turns and twists itself about in the fire! It beats its head against the roof of the oven. It stamps its little feet on the floor of the oven. You can see on the face of this little child what you see on the faces of all in hell—despair, desperate and horrible.'" It is to be hoped that the time will soon come when religious teachers will cease to be so unscientific as to inculcate such fundamental and cruel untruths. According to the doctrines of Calvinists, all persons, except a chosen few, are doomed to eternal punishment:—"Calvinistic doctrines appear in the Church of England and in the confession of the Church of Scotland, and are held by many Protestant sects" (Article "Calvinism," Haydn's "Dictionary of Dates"); and, "in its milder form, Calvinism is the professed creed of Presbyterians, Independents, Baptists, Methodists, etc." (Article "Calvinism," Beeton's "Dictionary"). Theologians assume and teach "that this world is a fallen world, and that man's position in it is merely a state of preparation for another and a better state of existence," without being able to give proper and sufficient evidence for such serious statements. We must not, however, forget that they consider it necessary to teach such doctrines in order to adapt religion to their hearers' capacities; and that there is no more effectual temptation, bribe, or inducement to them than the prospect of eternal happiness and redemption from eternal pain. According to Archbishop Whately, "A readiness on the part of the people for delusion is not so much the consequence as itself the origin of priestcraft" ("Detached Thoughts and Apothegms," 1856, p. 65), and this is probably true. The scientific method is the reverse of this, *i.e.*, not to adulterate truth to satisfy ignorant minds, but to raise ignorant minds to the level of truth; both methods are, however, necessary.

The common desire for an endless future life of happiness is largely based upon the unscientific notion that we do not receive our just share of enjoyment in this life. Apart, however, from the idea that "God is just," and all creation is a "scheme of benevolence," scientific men know by a vast amount of reliable evidence that the universe and mankind are kept in motion by universal energy, and in accordance with a perfect system of scientific laws. They know that in the countless phenomena of astronomy, physics, and chemistry, those powers are absolutely to be relied upon and

are exact to an extent of which unscientific persons have but feeble conception. They believe also that they operate as universally in all human actions as in inanimate ones, and that there is no sufficient reason to suppose that they are not equally to be relied upon in them. It may therefore be concluded that those powers never cheat any man, that no man can evade them, and that they automatically "balance up" each man's account of necessary pain and pleasure in an incomparably more accurate manner than any man could do it for himself. Ask any man if he would wish to live his life over again? and the reply in nearly every case would be No, because whilst he forgets the pleasures he has enjoyed, he at once recollects strongly the pains he has endured, the difficulties he has encountered, the losses he has borne, the arduous labours he has had to perform, the anxieties he has suffered, etc.

> "Rest! Rest! Oh, give me rest and peace!
> The thought of life that ne'er shall cease
> Has something in it like despair,
> A weight I am too weak to bear."
>
> —*Longfellow.*

The great mass of mankind who have not much studied the effects upon themselves of the operations of the great scientific forces which govern them; and even the greatest of literary, religious, and metaphysical thinkers, not possessing familiar acquaintance with those powers and laws, have been compelled by circumstances to believe that they will be recompensed hereafter for "evils" suffered in this life, whilst at the same time holding the belief that "our God is a just God," and other ideas inconsistent with the existence of real evil.

The essential cause of human anxiety respecting death and a future state of existence, is lack of fundamental scientific knowledge, if men knew the truth of the case they would be more free from anxiety about either. The same cause, viz., ignorant selfishness, which gives rise to unreasonable dissatisfaction with this life produces false and utopian ideas respecting a future one. Those who desire a future life are frequently those who do not possess a sound philosophy of this one, who wish for more pleasure than is rational, who, having largely missed their opportunities whilst young have not made their later part of life worth living. To those who possess true ideas of man's position on this earth, who believe in the universality of causation, who try to improve their minds and do the greatest good to all men, who obey all the chief rules of morality, and are free from much physical pain and undue mental anxiety, this life is a satisfying one; death is looked forward to as a natural consequence, and the fear of it is absent. The possession of sound scientific philosophy, confirmed by universal evidence, is a far better preparation for death than unprovable belief in a future existence. "What trouble is there in this life that can appear great to him who has acquainted himself with eternity and the extent of the universe? For what is there in human knowledge, or the short span of

this life, that can appear great to a wise man; whose mind is always so upon its guard that nothing can befall him which is unexpected" (Cicero). According to an eminent surgeon, the late Sir Benjamin Brodie, "the mere act of dying is seldom, in any sense of the word, a very painful process; the general rule is that both mental and bodily suffering terminate long before the scene is finally closed." "Those who have long been tormented by bodily pain are generally as anxious to die as ever they were to live. So it is often with those whose lives have been protracted to an extreme old age, even when they labour under no actual disease." "I have never known but two instances in which, in the act of dying, there were manifest indications of the fear of death" ("Psychological Inquiries," pp. 130, 131). Those who are near death usually wish to die. Death, like sleep, comes welcome to him who looks back on a life well spent. What is death? It is an eternal sleep; practically we die daily when we go to sleep; the chief difference is in the greater preparation required for permanent death, and the distress of mind of the survivors. "Death has no terrors when the life is true; 'tis living ill that makes us fear to die," and makes men wish for immortality:—

> "Else whence this pleasing hope, this fond desire,
> This longing after immortality?
> Or whence this secret dread, and inward horror
> Of falling into nought?"
>
> —*Cowper.*

The following quotation being pertinent to this subject, I venture to insert it: "Christians constantly tell Freethinkers that the principles of 'negation,' as they term them, may do very well for health; but, when the hour of sickness and approaching death arrives, they utterly break down, and the hope of a 'blessed immortality' can alone give consolation. In my own case I have been very anxious to test the truth of this assertion, and have therefore deferred to the latest moment I think it prudent to dictate these few lines . . . I do not believe in a heaven or life of eternal bliss after death. There is nothing in this world to induce me to give credence to the possibility of such a state of human existence. Wherever there are living organisms there are suffering and torture amongst them; therefore analogy would go to prove that if we lived again we should suffer again. To desire eternal bliss is no proof that we shall ever attain it; and it has long seemed to me absurd to *believe* in that which we wish for, however ardently. I regard all forms of Christianity as founded in selfishness. It is the expectation held out of bliss through all eternity, in return for the profession of faith in Christ and Him crucified, that induces the erection of temples of worship in all Christian lands. Remove this extravagant promise, and you will hear very little of the Christian religion. . . . As I have stated before, my mind being free from any doubts on these bewildering matters of speculation, I have experienced for twenty years the most perfect mental repose, and now I find that the near approach of death,

the 'grim King of Terrors,' gives me not the slightest alarm. I have suffered, and am suffering, most intensely, both by night and by day; but this has not produced the least symptom of change of opinion. No amount of bodily torture can alter a mental conviction. Those who, under pain, say they see the error of their previous belief, had never thought out the problem for themselves" (Austin Holyoake's "Sick-room Thoughts," quoted by C. M. Davis, "Heterodox London," vol. ii, p. 399; and by Rev. H. J. Clarke, "The Fundamental Science," 1885, p. xviii). We must not forget that rational selfishness is no crime, but, on the contrary, a great stimulant to avoid it, and not only a justifiable but indispensable condition of life; selfishness must, however, be kept within reasonable bounds, not so much by means of false beliefs as by commanding knowledge, power, and evidence. The existence of selfishness in Christianity is necessary and justifiable within this limitation; but it is unscientific and "immoral" when it exceeds it. The entire scheme of a future life is largely based upon self-love, but that does not prove that the teaching of it is the least objectionable course that could be taken.

Why do so many persons believe, without proper and sufficient evidence, in a future state of existence of the human mind after death? They are practically compelled to do so by the influences within and around them: (1) Being imperfectly trained, they find it much easier to "swim with the stream" and adopt the unproved beliefs of those around them than to seek and verify the truth; (2) they prefer to believe that which is pleasant to that which is true, especially if the former is much more easily understood; (3) the popular view of the matter is a flattering and a comforting one; many persons suffer so much misery and pain in this life that they hope to be recompensed in a future one, and many others wish to renew in another life the friendship and affections of those whom they love in this one; (4) they are apt to forget the advantages they have received, and to remember more readily the evils they have suffered, and thus they look upon this life as a painful one, "a vale of tears"; and (5) nearly all persons are so much occupied in obtaining a living that they have not sufficient time or ability to properly investigate the subject. The doctrine, therefore, is not wholly entertained because it is believed to be true, but largely for other reasons. "Scherr characterises religion very well as the dread of death, and as a desire to live beyond death. And truly he is right when declaring that with many, religion is nothing more than the desire to make their dear ego immortal" (*The Open Court*, No. 129, p. 2087).

Nevertheless there is a sense, and a scientific one, in which man is immortal; matter and energy are never destroyed. In accordance with the great law of continuity of causation, all a man does, thinks, or says, affects all those who come after him throughout all time. Physically, the whole of the particles of the elementary substances of which man's body is composed exist so far as we know for ever; and every physical act he performs produces effects which have an influence forever; death is a changed

form of activity, because molecular motion continues, though in a largely diminished amount, in the material products of human decay, as in the living body which preceded it. Mentally also, every idea a man conceives, and every thought he expresses, produces an influence which is transmitted onwards after his death; "a book contains the soul of its author"; the spirit of the thoughts of all great men, Newton, Jesus Christ, Shakespeare, and others, continue to influence us in their writings; and in this sense the spirits of men continue with us after their deaths and are immortal; but this is very different from the ordinary view of "immortality of the soul." To be remembered after death is a rational desire, because the very memory of our good deeds are of benefit to those who come after us.

As all human actions are united together in series in time by the great principle of continuity, all those of an individual man are endless in their effects. The act of doing good confers an unselfish kind of immortality, because all men are benefited by it throughout all subsequent time; and in accordance with the great principle of causation, the benefit is certain:—

"Alike are life and death
When life in death survives,
And the interrupted breath
Inspires a thousand lives.

"Were a star quenched on high,
For ages would its light,
Still travelling downwards from the sky,
Shine on our mortal sight.

"So when a great man dies,
For years beyond our ken,
The light he leaves behind him lies
Upon the paths of men."

—*Longfellow.*

Another meaning of "immortality of the soul" may be included in that of heredity, in which mental characteristics are transmitted to some extent from parents to children. Huxley has stated this idea as follows:—"Everyday experience familiarises us with the facts which are grouped under the name of heredity. Everyone of us bears upon him obvious marks of his parentage, perhaps of remoter relationships. More particularly, the sum of tendencies to act in a certain way, which we call 'character,' is often to be traced through a long series of progenitors and collaterals. So we may justly say that this 'character'—this moral and intellectual essence of a man—does veritably pass over from one fleshly tabernacle to another, and does really transmigrate from generation to generation. In the new-born infant the character of the stock lies latent, and the Ego is little more than a bundle of potentialities. But, very early,

these become actualities; from childhood to age they manifest themselves in dulness or brightness, weakness or strength, viciousness or uprightness; and with each feature modified by confluence with another, if by nothing else, the character passes on to its incarnation in new bodies" (*The Open Court*, No. 479, p. 5107); this meaning may include nothing more than that the transmitted mental peculiarities are only inseparable concomitants of the inherited physical ones of the brain, and of the organs which act upon it.

"The denial of immortality is religiously not so heterodox as most believers suppose, for it has been forestalled in the Biblical sentence of Solomon: 'I said in my heart concerning the estate of the sons of men that God might manifest them, that they might see that they themselves are beasts; even one thing befalleth them; as the one dieth so dieth the other; yea, they have all one breath, so that a man hath no pre-eminence above a beast; for all is vanity. All go unto one place; all are of the dust, and all turn into dust again.'—Solomon, in Ecclesiasties iii, 18-20" (*The Open Court*, No. 221, p. 3023); even Job asked the question, "if a man die shall he live again?"

Various writers have expressed the opinion that the sufferings of mankind necessitate a future state of happiness after death; but as pain is necessary to the preservation of life and to pleasure during life (see sections 37, 38), this opinion loses its force. The great majority of men and women will have present personal enjoyment at nearly all hazards, and future enjoyment also if they can get it. It is usually the weak, either in body or in mind, who wish to have the bitter pill of life gilded for them. As the desire for enjoyment is a great temptation to all men, and lies deeply ingrained in the human cerebrum, the most that can be expected from continual public exposure of its fallacy will be very small. In addition to these facts, we must not forget the first law of motion, that whatever is must be until some cause arises to prevent it, from which we may infer that whilst all men should improve, all changes require time, and sufficient time must elapse to enable mankind to substitute truth for error. As a system of false beliefs is nearly as strong as a system of true ones, it can only be gradually overcome by the latter, and the rate of progress of morality must continue much the same as it is now, independently of the wishes of all men, so that the supporters of dogma need not be unduly alarmed, nor the advocates of science be too sanguine, respecting the rate of progress of truth.

Men in general are apt to believe that what is delivered to them as truth by teachers of theology, with all the awe and solemnity of truth, in great and costly buildings devoted to religious worship must be true, but such a conclusion is by no means a necessary one, that alone is true which is consistent with all known truth, and all other additions only tend to obscure it. In common life, for a man to live in peace with his fellows he must either raise or lower his standard of conduct to the level of theirs:—

" Oh, how weak
Is mortal man ! how trifling—how confined
His scope of vision. Puffed with confidence,
His phrase grows big with immortality,
And he, poor insect of a summer's day,
Dreams of eternal honours to his name ;
Of endless glory and perennial bays.
He idly reasons of eternity,
As of the train of ages,—when, alas !
Ten thousand thousand of his centuries
Are, in comparison, a little point,
Too trivial for accompt."

—*Henry Kirke White.*

46. Memory.

Memory is conservation of ideas. It is a tendency to organic repetition (G. H. Lewes, " Physical Basis of Mind," 1877, p. 462). It is the power of retention and reproduction of cerebral impressions, and has been defined as the capacity which the mind has " to revive perceptions which it once had, with this additional perception annexed to them, that it has had them before." It has also been said to be " the most mechanical of all our intellectual powers." Temporary ideas are probably due to those impressions which are not sufficiently strong to strain the nervous substance beyond the limit of its permanent elasticity ; and fixed ones are due to those which are strong enough to pass that limit. Mental life is a continual alternation of remembering and forgetting. " Memory enters into every act of thought " (Archbishop Thomson, " Laws of Thought," 1875, p. 7). The fixation of an idea in the memory depends upon the high degree of impressibility of cerebral matter, and the strength and number of the impressions made upon it ; each repetition deepening the effect ; it is in this way that the human mind gradually becomes a representation of Nature. Memory is greatly assisted by co-ordination of ideas, and by referring facts to principles ; also by making notes of all the most important ideas and reading them occasionally. The greater degree of interest we feel in an idea, the more attention, study, and time we give to it, and the more intimately we understand it and associate it with other important ideas with which we are familiar, the more firmly do we secure it. " The images which memory presents are of a stubborn and intractable nature. The objects of remembrance have already existed, and left their signature behind them impressed upon the mind, so as to defy all attempts at erasure or of change " (Dr. S. Johnson, *The Rambler*). Ideas are not the only influences which make more or less permanent impressions upon man's nervous and other tissues ; smallpox, syphilis, leprosy, gout, and some other diseases and afflictions, are also more or less ineradicable ; and as we should be very careful not to fix those serious diseases in our body, we should be equally careful not to fix seriously false or unproved ideas in our

minds or in those of our children. Of the way in which a physical sensation is converted into a mental perception or idea and recorded, or *vice versâ*, we at present know scarcely anything; and this is not surprising when we consider that we know as yet but little of the way in which any of the physical forces or actions of Nature are converted into each other; but it is highly probable that in proportion as the latter are discovered, a similar explanation of memory will be arrived at, and will be found to include a conversion of modes of molecular motion of chemical into nervous energy.

Memory is sometimes independent of consciousness, thus we may revive a cerebral impression, of which at the time we received it we may not have been distinctly conscious; multitudes of impressions upon the brain continue latent without our being continually conscious of them and may be revived at any time. These phenomena are much like those of undeveloped photographic impressions and of Neipce's experiments on "latent light." There is strong reason for believing that many permanent impressions are made upon the brain without our perceiving them at the time; and, under suitable conditions of subsequent excitement (by dreams, disease, etc.), they become evident. Some remarkable instances affording evidence which supports this conclusion have been recorded (Carpenter, "Mental Physiology," p. 437). As every photographic impression may be rendered visible by suitable "developers," so also can cerebral ones by suitable excitement, probably by oxidation of the particular cells of cerebral substance upon which the impressions were made. In reading a book, if even an unimportant sentence which we seem to have entirely forgotten, has been repeated in exactly the same words, the brain automatically detects it, thus showing that even the slightest impression has been recorded. The mere act of dreaming sometimes makes such a strong impression upon the brain, that even during our waking hours we are unable to determine whether the impression arose from real experience or from the dream; we open our eyes and know that we are in England, we close them and fancy ourselves in "Cathay," or as some persons have asserted "in Heaven."

It is necessary not only to acquire and store ideas, but also to remember and recognise them. It would not be of much use for us to store our minds with thoughts, if, when we required to use them, we had to wait for their reappearance; nor would it be a much more perfect arrangement if we could recall but not recognise them; we employ attention and sometimes close our eyes to assist us to remember. Without memory there would be no mental development, and our other mental powers would be nearly useless, because it supplies us largely with the material for thought; when Faraday's memory failed him he was unable to make any more discoveries. If we could only reproduce our original feelings and ideas, but not recognise them as prior experiences, our previous life would appear a blank, and we could not identify ourselves with ourselves from time to time; on memory, therefore, depends largely the power of identifying present things with their existence in the past. The recollection of an object is usually very much less vivid than the original impression of it,

even though that impression was very recent. An infant, during the first year of life, has little or no memory, because its brain is undeveloped. Those who acquire knowledge slowly, usually retain it more permanently.

Memory is evidently dependent upon material conditions and subject to scientific laws. The possibility of memory appears to depend essentially upon permanent physical changes produced by impressions in the grey cortical layers of the cerebrum. That memory is due to such organic change is shown by the fact that sometimes ideas which have been entirely forgotten are recalled by cerebral excitement; and that it depends upon the state of the brain, and upon all bodily conditions that affect that organ, is shown by abundance of evidence. "It may be questioned whether impressions are really left upon our minds by anything else than ideas" (Carpenter, "Mental Physiology," p. 431), and this is in accordance with the fact that we cannot as distinctly remember pain itself as we can the idea that we have suffered it. We also grow much more quickly out of remembrance of physical sensations than out of that of ideas, partly, however, in consequence of the latter being more frequently repeated. It is probably owing to an action or property of nervous matter analogous to partial elasticity, that the permanent idea immediately due to a sensation is much feebler than the sensation itself. The more purely physical the impression, the less is it usually retained in the memory; thus, our remembrance of great physical pain or pleasure is extremely inadequate; that of taste is usually less permanent than that of sounds, and of sounds less than that of sights. Sight is the most intellectual of all the senses; it yields the most enduring of recollections, and our ordinary thoughts are largely composed of ideas of what we have seen or heard. According to Müller, "we know that every idea is a permanent immutable impression on the brain, which may at any moment present itself anew if the mind be directed to it —if the attention be turned to it—and that it is merely the impossibility of the attention being occupied by many objects simultaneously that causes each to be forgotten. All these latent ideas must be regarded as impressions on the brain which cannot be effaced. Lesions of the brain may annul a part or all of these ideas" (F. Winslow, "Obscure Diseases of Brain and Mind," 1860, p. 440). "There is memory in every nerve-cell, and indeed in every organic element of the body" (Maudsley, quoted by Rickaby, "First Principles of Knowledge," 1896, p. 374).

Notwithstanding that the brain is continually wasting and assimilating new material, mental impressions remain. "If it is asked, How can the brain be the organ of memory, when you suppose its substance to be ever changing? or, How is it that assumed nutritive change of all the particles of the brain is not as destructive of all memory and all knowledge of sensuous things as their sudden destruction by some great injury is? the answer is, because of the exactness of assimilation accomplished in the formative process; the effect once produced by an impression upon the brain, whether in perception or intellectual act, is fixed and there retained; because the part, be it what it may, which has thereby changed, is exactly

represented in the part which, in the course of nutrition, succeeds to it" (Paget, "Lectures on Surgical Pathology," vol. i, p. 52). A similar reproduction of impression occurs with a mark of small-pox on the skin; whilst the latter continally wastes and renews, the mark remains. The persistency of ideas in memory, like that of forms in vegetables and animals, etc., is probably a consequence, and one of the numerous forms of manifestation, of the great principle of inertia, or persistency of material state. A body in a state of rest or motion tends, under a continuance of the same conditions, to remain in that state until something arises to alter it, and thus maintains a continued series of similar conditions as in the continuance of similar forms or impressions.

The power of receiving impressions which may afterwards be revived or recalled, is not confined to living cerebral matter, but exists also in inanimate substances, and even in metals; for instance, in all latent photographic impressions before they are developed; also in what is known as Moser's pictures, and in Chinese mirrors, etc., the latent images of which may be developed at any time by simply breathing upon them. "If on a cold polished piece of metal any object, such as a wafer, is laid and the metal then be breathed upon, and, when the moisture has had time to disappear, the wafer be thrown off, though now upon the polished surface the most critical inspection can discover no trace of any form, if we breathe upon it a spectral figure of the wafer comes into view, and this may be repeated again and again. Nay, even more, if the polished metal be carefully put aside where nothing can deteriorate its surface, and be so kept for many months, even for a year, on breathing again upon it the shadowy form emerges; or, if a sheet of paper, on which a key or other object is laid, be carried for a few moments into the sunshine and then instantly viewed in the dark, the key being simultaneously removed, a fading spectre of the key on the paper is seen; and if the paper be put away where nothing can disturb it, and so kept for many months, at the end thereof, if it be carried into a dark place and laid on a piece of hot metal, the spectre of the key will come forth. In the cases of bodies more highly phosphorescent than paper, the spectres of many different objects which may have been in succession laid originally thereupon will on warming emerge in their proper order." "These illustrations show how trivial are the physical impressions which may be thus registered and preserved. A shadow is said never to fall upon a wall without leaving thereupon its permanent trace, a trace which might be made visible by resorting to proper processes. All kinds of photographic drawing, in their degree, are examples of this kind" (J. W. Draper, M.D., "Human Physiology," p. 288, New York, 1856). Photographs, phonographs, and cinematographs have more complete and retentive memories than man, probably because they waste much more slowly than the human brain. Other organic solids besides brain, which grow and decay, perpetuate impressions. Physiology supplies many instances of actions analogous in some degree to memory, the effect of small-pox inoculation is an example, the protective

effect upon the blood continues though the blood incessantly wastes. "Professor Hering most ably demonstrates in his famous monograph on memory, that memory is a universal principle of organised substances" (*The Open Court*, No. 113, p. 1901); and is evidently subject to scientific laws.

Memory is greatly assisted by arranging ideas in groups under the headings of great fundamental principles, as they are in well-written scientific text-books; or by connecting them together by natural bonds of union in orderly series, as in tables of specific gravities; or by arranging them in groups with the tie of similarity, as in classified chemical groups of substances. We usually associate in thought the ideas of things which are associated in nature; for instance, redness with copper, hardness with iron, elasticity with steel, india-rubber, and gases. We also associate together in thought ideas of things which are similar but are not necessarily associated in nature; thus the idea of redness we associate with the ideas of all things which we know to be red; hardness with those of all things we know to be hard, and so on. In accordance with these rules, the impressions made upon the brain by sensations, emotions, and ideas are linked together by association and habit, not only in groups, but also in trains or series; and in a well-arranged mind, much in the same order as the existences which they represent are bound together by the laws and principles of Nature. The great truths of Nature, therefore, should be the "central ideas" of mind, and the mental connections of things should be the same as their actual essential relations, especially that of cause and effect; the mind should be a truthful picture of Nature.

The action of memory in recalling ideas depends essentially upon latent association of impressions. When an idea in a series is excited, it tends to raise both "contiguous" and "similar" ones. Thus, that of redness in copper tends to raise the contiguous ideas which constitute the compound conception of some red substance and of other substances of similar colour. The idea of magnetism tends to raise the idea of iron, and conversely, the idea of iron tends to raise that of magnetism; and the action is called "associative suggestion of ideas." We cannot recall an idea of an object without including some of its immediate associations, for instance, if we think of the face of a person we include ideas of something more than the face; or if we think of the door of a house we realise some of the surrounding structure; or if of a street we think also of some of the streets which branch out of it. All this is consistent with the physiological view that a single small locality of the brain cannot be excited to action without the excitement spreading more or less to its most immediately related parts:

> "Lulled in the countless chambers of the brain,
> Our thoughts are linked by many a hidden chain.
> Awake but one, and lo! what myriads rise!
> Each stamps its image as the other flies."

Nothing can act alone or cause itself, nor directly and immediately act upon itself; thus "the eye cannot see itself" (G. H. Lewes, "Problems of Life and Mind," 1874, vol. ii, p. 484); the hand cannot grasp itself, nor the foot kick itself; the will cannot directly cause itself, nor the mind simultaneously contemplate itself; and similarly the memory cannot excite itself, the excitement must come from without, probably by some influence causing a flow of oxygenated blood to a particular part of the brain and stimulating it. Memory being largely automatic, we cannot by mere effort of will always directly recall any idea; all that we can do towards it is to excite to a higher degree of intensity any idea that is already consciously present; and if that idea happens to be connected by any bond of association with the lost one, the excitement usually extends sufficiently to the latter to make it perceptible.

In order to recall a forgotten idea, we, in some cases, intentionally pass in review a number of ideas which we think are likely to be related to it in the hope that one or other of these will suggest it; for instance, if it is the name of an acid or of a metal, we pass in review in succession all the names of that class of bodies we can think of; and, to make the list as complete as possible, we take the names in alphabetical order, trying each consonant and its combination with each of the vowels, and we are thus sometimes enabled to select a few names which sound somewhat like the desired one; and by further similar treatment of these we usually find the one we are in search of, or we seek the aid of a suitable book. Similarity of sound is often a powerful means of suggesting a lost word, and we have by the above plan always at hand a ready means of employing it. We cannot recollect a forgotten idea at all, nor even know that we have forgotten it, unless we are already conscious of some idea more or less related to it by association; and the reason why we feel sure that we really possess a latent idea which we cannot recollect, is because we always have in such a case a vague residuary perception of its existence. In consequence of ideas being connected together in groups, and linked together in chains or series, and of our ability also of recalling them after a lapse of time, if the mind once becomes stored with ideas, and even if the senses are lost, the memory can recall the previously acquired ideas, and in this way supply the mind with materials for thought and reflection; thus a man who becomes blind can remember his former visual impressions. It is usually easier to recollect general ideas than special ones, unless the latter are very familiar; thus it is more easy to remember the ideas of heat and cold than the names of persons and places; the latter ideas fade the earliest in old age.

The action of the memory, like that of various of our physical organs, is not only largely automatic, but often unconscious. Multitudes of past experiences and impressions constantly arise spontaneously into our mental vision by chemico-cerebral action, without our experiencing any conscious exertion, and even in opposition to our will. The act of associative suggestion of ideas is sometimes attended by consciousness and sometimes

not; there is strong evidence for believing that, during our waking state, precisely similar, though probably feebler, trains of mental action occur in our brain when we do not observe them, as when we do; similar to many of our muscular actions which are both automatic and unobserved by us. The spontaneous occurrence of such ideas is probably due to unnoticed impressions upon our nerves, both from within and from without, altering the local circulation of blood in the brain.

All these remarks respecting the memory show the value of that faculty, and therefore the importance of educating it. "It is said that Sir Isaac Newton, at one period of his life, entirely forgot the contents of his celebrated 'Principia,' in consequence of neglecting to exercise his memory" (F. Winslow, "Obscure Diseases of the Brain and Mind," 1860, p. 680). On the other hand, "It is a fact well attested by experience that the memory may be seriously injured by pressing upon it too hard and continuously in early life"; but "a regular exercise short of fatigue is improving to it" (Sir Henry Holland, "Mental Pathology"). There is a limit to the number of ideas which the human mind can contain, and powerful new ideas gradually weaken the impressions of feeble ones by preventing their repetition, unless the latter are associated with many others by a strong bond of contiguity, such as that supplied by a knowledge of general principles. To discipline the memory, and acquire ready and accurate use of our knowledge, ideas should be recalled from time to time by practice in speaking or writing, for Lord Bacon said, "Reading makes the full man; writing an accurate man; and speaking a ready man." Ideas revived by the memory, especially during the first half of one's life, may, by means of study and repetition, be made even more vivid and permanent than they were originally. Our oldest thoughts are often the most enduring, chiefly because the cerebrum of young persons is usually more receptive of impressions, and partly because old ideas have been so many times repeated. Forgetfulness is often due to thinking of one thing when we ought to be thinking of another; we should therefore always think of what we are doing. The number of ideas, simple and complex, which are capable of being stored up in the brain is very great, especially in the brain of a well-trained intelligent person, and this is not surprising if we consider that the cells of the grey cerebral matter are the storehouses of ideas, that these number about "600 millions," and admit of a practically infinite number of combinations in the formation of concrete ideas. The different numbers stored-up in different persons are closely related to the number of words used by them, which have been stated to vary from about three hundred in a farm labourer to fifteen thousand in Shakespeare. The memory is usually the first faculty to deteriorate by old age. Various observers have remarked that in old age we first forget names, then substantives, next verbs, and last adjectives; but the latter we hold very tenaciously, largely because they have been frequently repeated. Accord ing to Gratiolet, "the coincident is more easily forgotten than the correlative, the consequence remote more readily than the consequence

immediate." According to the late Cardinal Newman, "there are a hundred memories, as there are a hundred virtues" ("A Grammar of Assent," 1870, p. 334); more correctly speaking, there are many forms of memory.

In accordance with the great principles of causation and evolution, it is a general truth respecting mental action, that the effectual reception of a mental impression, or the capability of understanding a subject, depends essentially upon earlier impressions stored up in the brain, and, unless a person already possesses a suitable kind and amount of preparatory knowledge, he is unable to receive that which is more advanced; and we know that unless he already possesses the rudiments of knowledge he cannot understand anything. For instance, boys are only admitted into more advanced classes in educational institutions, or even into the institutions themselves, provided they possess the necessary preparatory knowledge, and the latter is usually ascertained by means of preliminary and entrance examinations. A child must be able to mentally walk before he can run in any subject, and a similar remark applies to every human being and to every nation; unless the necessary preparatory state exists, the succeeding ones cannot be produced. There are multitudes of persons who will be unable to understand some of the ideas contained in this book, solely because they do not possess the necessary preliminary scientific knowledge. These various facts illustrate the dependence of memory upon scientific conditions.

Whilst the faculty of remembering is very valuable, so also is the ability of forgetting, especially to persons who have many cares and anxieties, and to those who have much mental labour. A man who cannot forget his ideas when necessary, is unable to restrain his desires, resist temptations, command sleep, nor keep his mind or body healthy. Circumstances and environments will act upon us directly whether we are willing or not; and we recognise this by our conduct, for when the brain is much distressed, seeking quiet, needing rest, we seek new environments.

47. "Freedom of the Will."

The question of freedom of the will is a complex and abstruse one, and has frequently given rise to wordy discussions; the following are a few quotations respecting it:—"Will is original uncaused cause" (A. Winchell, LL.D., "Science and Religion," p. 298). Will is "the inner mystery of human life" (H. Calderwood, "Handbook of Natural Philosophy," 1875, p. 191). "Will is a kind of causality belonging to living agents in so far as they are rational" (Kant). "There is a will present in every cell" (A. J. Bell, "Why Does Man Exist?" 1890, p. 188); the germ of truth in this is, that each cell in the human organism has its own particular group of molecular movements which determine its own particular reactions and look like volitions. The will is "a psychological ghost"

(H. C. Bastian, "The Brain as an Organ of Mind," 1890, p. 569). The will "is not the cause of anything," but may be compared "to the verdict of a jury" (T. H. Ribot, "Diseases of the Will," 1894, p. 133) :—"willing and acting are quite distinct" (*ibid.*, p. 119). "There is no will, but only volitions";—"the ego is not an entity, acting as it chooses" (*ibid.*, "Diseases of Personality," pp. 5, 15, 42). "A mere will without any motive is chimerical and contradictory" (Liebnitz). "We cannot will to will" (H. Calderwood). Sir William Hamilton truly said that to prove freedom of will a man must be able, without any motive, to will his own will. We have no absolute freedom of will, but the mind is caused to wish this or that by some other influence, which itself has been caused by some other influence, and this last by yet another, and so on to infinity (Spinoza).

The will is an ordinary mental action in an endless series, usually a desire or resolution to effect an object already in the mind. Like every other natural action, it cannot determine itself; there must be some seen or unseen cause within or without us for every act of volition and for the motive which prompts it; great actions are sometimes started by small volitions. The will is either free or not, according to circumstances; there are limits to the freedom of every volition, thus a man cannot by a direct action of will stop his own thoughts; "a painful idea will return again and again into consciousness, notwithstanding every effort of the will to get rid of it" (J. M. Fothergill, M.D., "Maintenance of Health," 1874, p. 269); similarly, if once a portion of food gets sufficiently far into the throat, no effort of will can prevent its being swallowed. It is largely because the will cannot cause itself that we are unable to mentally improve ourselves by direct methods:—

> "The eye cannot choose but see;
> We cannot bid the ear be still;
> Our bodies feel where'er they be,
> Against, or with our will."

In nearly all cases men are willing to admit a reasonable or sufficient cause for their conduct; and if in cases of dubious behaviour we ask any man why he acted in the way he did, he in almost every instance either adduces a proper and sufficient motive, or else the plea that he was compelled to do it, and it is only in cases where men do not perceive the motives of their actions that they say they did not know why they did it. There are many cases in which the circumstances that influence us and liberate our energy are so small or obscure, or our powers of detecting them are so feeble, that we are unable to rationally explain our own conduct; intoxicated persons are frequently in this position. It is largely because we cannot readily survey our own mental actions that the will appears so mysterious.

We flatter ourselves that we create our volitions, whilst the fact is our

volitions are really caused by the energies of Nature operating through and within us. We all do and think as we must under the particular conditions, and many of the acts we must do we like to do, because they are either habitual, agreeable, or preferable. Volitions are really compulsions, but they appear to be acts of free will because we are consciously ready to perform them; and we feel as if they were done at our command, simply because they are always immediately preceded by our conscious mental action and desire. We are much more conscious of our voluntary actions than of our automatic ones, because they require thought; and it is largely because we think about our volitions immediately beforehand that we fall into the error of supposing that they are caused by our "will." Volitions are not self-created phenomena, such as the ordinary view of them requires them to be, but are produced by internal and external stimuli, thought being usually only an accompaniment of their production. As our automatic actions are often much more powerful than our volitional ones, in cases of hunger, animal desire, etc., it is evident that the natural stimulus which causes the one is sufficient to cause the other.

Many actions are mistaken for "will" which are no volitions at all. "The body has the power, in virtue simply of its physiological mechanism, without any help of will, to execute most complex purposive acts in the most perfect manner" (Maudsley, "Body and Will," p. 109), and it evidently acquires this power to a considerable extent before it is born. "As soon as the chicken is out of the egg-shell it pecks at a grain of corn with quick and certain aim" (*ibid.*, p. 108). "The fly-catcher, immediately it is out of the egg-shell, catches an insect with its beak" (*ibid.*, "Physiology of Mind," 1876, p. 201). "The nervous system has the power, instinct in its constitution or acquired by training, to execute mechanically, acts that have all the semblance of being designed and voluntary, without there being the least consciousness or will in them" (*ibid.*, "Body and Will," pp. 107, 108). If the thigh of a frog be touched with a drop of irritating acid, the frog rubs it off with the foot of that side; and if prevented from using that foot for the purpose it makes use of the opposite one; and if the frog's head is cut off, and its intelligence and will thus removed, it behaves exactly the same in these respects (*ibid.*, pp. 106, 107). "The nervous system has the power to execute through the proper muscular mechanism purposive acts, without any intervention of consciousness or will," and one "nervous centre may, if it reach a certain pitch of ecstatic activity, so far inhibit other centres as to paralyse their functions for a time; as we see in the examples of the religious ecstatic, of the soldier who feels not at the time the wound received in the transport of battle, and in many like instances" (*ibid.*, p. 112). It is well-known that in states of great excitement of the nervous system, such as in a fearful railway collision, even the pain of fatal wounds and injuries is often not felt at once, and that it is not until the general excitement has subsided that the pain is noticed.

In the excitement of battle a soldier often feels not his own wounds,

because his consciousness is occupied by something which makes a stronger impression, and not because he "wills" not to feel his wounds. Similarly, a martyr at the stake feels not the flame so much as the excitement of religious ecstasy into which his feelings have been wrought (*ibid.*, p. 112). Savages have borne tortures without wincing, even as religious ecstatics. "See how the ignorant savage, taken prisoner by his enemy, endures the menaces and tortures to which he is subjected without uttering a single sigh or cry for mercy, or making the least sign of submission; with what an invincible courage he braves his tormentors, railing at them and defying them to do their worst, reproaching them with their impotence to extract one cry of pain, exulting and insulting over them in boasts of the greater tortures which he has made their people suffer. All this is because the custom of tribal belief, deeming it the glory of a death by torture to triumph in such stoical endurance, has trained his nature into such a development as when stimulated to an esctatic transport to vanquish its natural sensibilities" (*ibid.*, p. 155). The appearance of heroism is often no heroism at all, and has frequently little or no volition in it.

"No one can resolve successfully by a mere effort of will to think in a certain way, or to feel in a certain way, or even, which is easier, to act always in accordance with certain rules; but he can, by acting upon the circumstances which will in turn act upon him, imperceptibly modify his character" (*ibid.*, "Responsibility in Disease," 1874, p. 273). "Just in fact as an individual gains by practice a particular power over the muscles of his body associating them in action for the performance of complicated acts, which without previous training he could no more perform than he could fly, and rendering his muscles in this regard habitually obedient to the dictates of his will; so can he gain by practice a particular power over the thoughts and feelings of his mind, associating them in action for the accomplishment of a definite purpose in life, and rendering them in this regard habitually obedient to the dictates of the will in the pursuit of its ideal" (*ibid.*, p. 274).

Largely in consequence of deficiency of scientific knowledge an idea has arisen that the will is a self-created power which enables a man to do a great many wonderful deeds; thus, "the will is to science the first example of power"—"the bodily effort made by the will lies at the root of the conception of force. It is by comparing other forces with that force that science begins its march"—"the will is the one and only force among the forces of this world which takes cognisance of principles and is capable of acting," etc. (Bishop Temple, "The Relations between Religion and Science," 1885, pp. 69, 46). According to scientific evidence, however, the will is not a "force" or real cause at all. It is in consequence of deficiency of such knowledge that powerful motives, strong passions, and intense nervous emotions, are attributed to strength of will and to supernatural agency; for instance, a late popular expositor of religion said:—"You may torture the body of a man with fire or the rack, but he can defy all physical constraint; you may compel his intellect by the sheer force of

logic to accept the most unwelcome truth, but his will can decline to act, even under the pressure of the most conclusive demonstration; you may excite his strongest passions, but his will may refuse to be swayed by them. The will is a supernatural power." "The voluntary activity of man lies beyond the limits of science." "Every language man has ever spoken—no matter how perfect or how rude—the literature of the ancient and of the modern world, the indestructible instincts of the human soul, the testimony of consciousness, unite to affirm that the human will is independent of natural law" (R. W. Dale, "The Mutual Relations of Physical Science and Religious Truth"). A man whose "will can decline to act, even under the pressure of the most conclusive demonstration," must be a very bigoted person and one who would abide by a false belief at all hazards. Another writer on morality says:—"In every genuine volition we have a phenomenon not law-determined, law-regulated, law-explained" (L. Turner, M.A., "Wish and Will"). These quotations show that notwithstanding the great extension of scientific knowledge, belief in supernatural excitation of the human will is publicly maintained by prominent religious teachers. The idea that "the will is a supernatural power" is a relic of the dark ages.

If, as asserted, "the will is a supernatural power," it would be unaffected by natural powers and mere natural substances, and experiments could not be made upon it by means of alcohol, opium, chloroform, or other drugs. But even the most confident believers in the above assertions deplore the serious injury which the abuse of alcoholic liquids has upon mankind by debasing the power of the will. And if it was "not law-determined, law-regulated, and law-explained," it would be a cerebral action without a cause, a creation of power, but throughout the vast range of scientific experience no such phenomenon has ever been observed. If a man was really in any degree governed by "a supernatural will" instead of by the great laws of Nature and ordinary causes, we could not trust him in anything lest his supernatural will might affect him.

We may logically infer from the scientific and rational constitution of the entire system of the universe, that it is essentially more consistent with all truth, that mankind should in all cases be compelled to do as they now do, have the degree of liberty they now possess, make occasional mistakes and be punished, subsequently correct their mistakes and improve; and be able to look forward with certainty to an endless course of improvement and happiness in the future, than that they should possess arbitrary freedom of will.

It is an exceedingly important circumstance for the moral salvation of mankind that the will is not "a supernatural power," and that it is governed by energy and law as rigidly as are all other actions of bodies. The enthusiastic exercise of the will independent of reason, or "I will have my own way," has led millions of human beings to moral ruin and an untimely grave, and the advocacy of the use of such a power unguided by intellect, in opposition to "the pressure of the most conclusive demonstration," is highly

opposed to morality; it is well-known that it is the power of reason rather than of "will" which "gives to man his supreme dignity." We must not forget that in all ages, a belief in supernaturalism has caused men to resist the progress of law, of science, and of civilisation. If a man's will was much more free than it is, there would be no reliable government of human conduct.

The human "will" is as truly, and no doubt as completely, subject to the great law of causation as any inanimate action; men must believe and act, whether they will or not. "Our illusion of free-will is only ignorance of the motives which make us act" (Spinoza). "What we call will is only the result of all the forces acting upon us, and it follows invariably the line of least resistance. The illusion of freedom is due to the fact that the complexity of these forces makes the results to us incalculable. We *seem* to be free" (H. Spencer, see "Science and the Faith," by A. L. Moore, 1889, p. 78). It is very true that "we have a direct consciousness of being free, a consciousness which no reasoning appears to diminish" (Bishop Temple, "The Relations between Religion and Science," 1885, p. 71); but consciousness is frequently a great deceiver; we are only free in certain cases and within certain limits to act as we will; it is useless to will impossibilities.

Freedom of will is only a particular instance of a general truth, viz., that all bodies whatever, under certain conditions, are free to act in certain ways and within certain limits, but not in others, and are not only free to act but are compelled to do so. "Man is as free as a bird in a cage; he can live within certain limits" (Lavater), and all human experience confirms this. The freedom of action of all things, and the various ways in which they are free to act, differ directly as the kinds of their structures, properties, and environments; and the degree of their freedom changes directly as either of these are changed—thus man possesses the most varied and most complex structure of all bodies, and has the greatest differences of properties and of freedom; but as some of his faculties are feebler than the same ones are in some other animals he has less degree of freedom than them in those particular respects (see section 41); thus whilst he can reason better he cannot run as fast as a greyhound. In agreement with the universal truth that the general freedom of bodies varies directly with the degree of complexity of their structure, we find that a man has more varied freedom than a dog, a dog than an oyster, an oyster than a tree, and a tree than a stone. Rousseau's statement that men are born free, but everywhere in chains, agrees with the conclusions of science. A convict in his cell is less free than a man in the open. We are only able to do as we "will," when our volition happens to agree with natural laws and circumstances.

In obedience to the great energies of Nature, all things are compelled to move in certain ways and are restrained from moving in others, but because a ball can roll downhill it does not follow that it has a "will." In the widest sense all things are determined by energy, and are equally

free to move in the direction in which they are most urged, and equally restrained from moving in that in which they are not urged. In the case of a fall from a height, or in that of a violent and sudden explosion, the freedom of man is no greater than that of a stone, as he often finds to his great injury. The large number and variety of accidents and diseases to which man is subject show the comparatively narrow limits of his freedom. Of course, a man may desire many things; but men do not usually will that which they believe to be quite beyond their powers. The will has little or no direct power over the internal processes of assimilation or excretion, growth or decay, and but little over the respiration, no man can commit suicide by holding his breath, however strongly he may will to do so; and before the human brain can effect an object, it has in many cases to consult its partners, the viscera, limbs, etc., and comply with many other conditions.

The limits of freedom are different in every different case. We are usually more free to obey moral rules than to infringe them, to do good than to do "evil," to confer pleasure than to cause pain; we are, however, in certain cases free to inflict pain for beneficent purposes, *i.e.*, to avoid greater "evils," and in those cases we follow the example of natural agencies. A man has usually perfect liberty to pay his debts if he has the means, but he has less liberty to defraud his creditors, because he knows that if he does so he will be punished. As Nature and knowledge are practically infinite, both in variety and extent, and all man's powers are very finite, there is sufficient freedom of will for every man; a man may fly across the Pacific Ocean if he is able. Every man is free to do almost anything that lies within his power, provided in doing it he does not improperly restrain the freedom of others; if, however, he restrains them, his fellowmen will restrain him.

We are "creatures of circumstances"; a very large proportion of our actions are the results of unobserved motives, internal and external promptings. We are all free to make some mistakes, and are punished for having made them. Persons of low or ignorant motives must obey them. Our freedom of will depends upon our powers; we are not all born equally free; some are born blind. We can obey our will more freely when we are well than when we are ill. Intelligent persons have greater freedom of will than ignorant ones; free men than slaves. "Liberty does not always bring enlightenment, but enlightenment brings liberty; and there is no liberty which is not based on enlightenment, on education, on culture, on morality, on wisdom and good will" (*The Open Court*, No. 123, p. 2015). "The will that is swayed by the highest motives is the most free" (Maudsley, "Body and Will," p. 234).

> "Freedom has a thousand charms to show,
> That slaves, howe'er contented, never know."
> —*Cowper.*

Our freedom of will varies directly and especially with the amount of

our knowledge of the great powers which govern the universe; in olden times men were more free to do wrong and less to do right than they are at present. Poor men have often greater freedom than rich ones, because they have a much less number of responsibilities; but in certain other ways, rich men have more freedom than poor ones. The greater our knowledge of Nature the more perfectly are we able to adapt circumstances to our desires; it is only by first obeying Nature's commands that we are able in return to command her. It is largely by the discovery and dissemination of truth that science conduces to freedom:

> "He is the free man whom the truth makes free,
> And all are slaves besides."
>
> —*Cowper.*

Nothing shows more clearly the limited freedom of man's "will" than his inability to command himself, he is unable to volitionally stop his consciousness or to command his own ideas. To dismiss one idea another idea must arise, the will cannot dismiss it (Maudsley, "Physiology of Mind," 1876, p. 439); we can only diminish cerebral excitement in some indirect way. These facts show that the freedom of the will, even to command that which is considered to be our very selves, is small, and like a phantom, retreats and diminishes the more we examine it by the aid of scientific knowledge. A man cannot cease from thinking and willing, simply because he cannot voluntarily stop the physical and chemical changes going on in his brain. Reason is not the influence which commonly guides the will; the usual cause of our volitions is our automatic wants and desires.

The power of volition varies very greatly in different persons—Napoleon the First had a very powerful will, whilst Coleridge the poet had a very feeble one. The inability of some persons to "make up their minds" is well-known; and a case is recorded of a man who took two hours undressing because he could not exercise volition (Dr. Bennett; T. Ribot, "Diseases of the Will," 1894, p. 29). De Quincey lost his power of volition through a prolonged use of opium (*ibid.*, p. 30), some men have lost volition entirely (Billod, *ibid.*, pp. 32-37); in other cases the power of volition has been changed by an injury to the brain (*ibid.*, p. 69), and in some remarkable ones the action was always the opposite to that determined by volition (*ibid.*, p. 65). The power of indirect self-government begins in an infant at about the age of ten months, by commencement of control of its evacuations, whilst that of volition in exciting increased action commences somewhat earlier (Preyer, *ibid.*, "Psychology of Attention," 1894, p. 44). All these circumstances indicate that what we term the will is as truly the result of influences acting upon us as in the case of any other physiological or mental phenomenon. The scientific view of freedom of the will is not fatalism, because it depends upon conditions and circumstances, whilst fatalism is freedom of will independent of all conditions.

48. Motives.

Motives may be defined as mental stimulants to action, in the form of desires, ideas, or conscious mental changes, due to environments; and they appear nearly wholly to act, not as direct causes, but as determining ones, which set free the real one—viz., the energy which produces the movement or effect. Similar to a feeble electric current sent through a wire, sets free by means of a relay at a distance a much stronger current which rings a bell or does other work, so a minute cerebral change, transmitted through a nerve, excites a distant muscle to liberate energy and perform a feat of strength. As motives are exciting causes, they are subject to the great law of causation, and are bound by the principle of continuity to their effects. Action in opposition to the strongest motive is impossible, and our legal enactments usually assume this. As men think, so they usually act, except in cases where they are impelled automatically, and the more intelligent the man is the more is he influenced by reasonable motives instead of by uncontrolled instincts or desires. The motives of insane persons are the same as those of sane ones, but are either extreme in degree, or out of proportion to realities (Maudsley, "Responsibility in Disease," 1874, p. 4).

In accordance with all experience, the same cause or motive, acting under exactly the same circumstances in every respect, is always followed by the same effects. Men are as much determined by their motives as inanimate substances are by their causes. Motives are probably not efficient causes but releasing ones, *i.e.*, they only release in succession the chemical, nervous, and muscular energy, which is the real cause and performs the act. It is inaccurate to speak of remote causes or effects as if they were immediate; of indirect ones as if they were direct; or partial ones as if they were entire; an idea selected by us during our youth and made the object of desire is not the immediate, direct, or entire cause of our subsequent success or failure in life. A series of phenomena, the first one of which is a feeble one set in motion by desire, often increases greatly in magnitude and complexity as it proceeds, in consequence of the co-operation of liberated energy; and ultimately leads a man on either to victory or to ruin. The motives which determine human thoughts and actions are essentially influenced by the universal condition, time. It is often because pleasure is immediate and punishment is remote, that men and women yield to temptation; risk the greatest future pain for the sake of present enjoyment; and sacrifice great advantages in the future in order to avoid a small immediate loss or labour.

Human motives and combinations of motives are exceedingly numerous and varied; they are different in every different person, and more or less so in every different case. The most comprehensive rational motive of human conduct is perfect obedience to all the powers and laws of our

being, and the noblest is to do the greatest good; the former practically includes the latter, because when we perfectly obey it we do the greatest good of which we are capable. The chief motives are the appetites and cravings, hunger for food, gratification of animal passions, family ties, love of home and children, love of amusement, desire for exercise, change, recreation, notoriety, self-interest, love of money and power, ambition for social and political influence, patriotism, love of fame or of knowledge, a wish to improve, a sense of duty, and a constant desire to do the greatest good to all men; the whole of these springs of action are necessary for complete human existence and welfare. A wish to do the greatest good imparts the purest peace of mind. "Peace, oh virtue, peace is all thy own" (Pope). The noblest motives are usually the rarest: "There is hardly any one who sets self-development before him as an aim in life. The aims which chiefly predominate—riches, position, power, applause of men—are such as inevitably breed and foster many bad passions in the eager competition to attain them" (Maudsley, "Responsibility in Disease," 1874, p. 290). "Modern fame is too often a crown of thorns" (Tennyson).

Human life, however is too short, and the powers of man are too limited, to permit the full exercise of all these motives by a single man, and different men are therefore actuated by different motives, and by the same motives in different degrees. The lowest class of men are determined by the lowest motives—viz., the gratification of the animal passions and selfish desires; a vast number by the love of money, and the self-gratification, power, and influence which it can purchase; a goodly number by a desire for social and political influence; a smaller number by a love of knowledge, self-improvement, and fame; and a comparatively few by a high sense of duty and an earnest wish to do the greatest good to all creatures. It is well for mankind that motives are thus distributed; for if all men were stimulated only by the lowest motives there would be little or no progress in civilisation, and the race might die out by self-extermination in the struggle for self-gratification, and if too many were actuated only by the highest ones, progress would be too rapid to ensure stability and for ordinary human beings to bear. If the motive of personal "salvation" is strong in a person, the love of fundamental scientific truth is usually weak; he who intensely desires eternal happiness is too absorbed to examine the question of its reality.

Although all kinds of motives are necessary for mankind as a whole, different kinds of employment require different motives in order to induce men to undertake them; and as motives are determining causes, they must be adapted to the effect to be produced or work to be performed. Common motives are best adapted to common work, and superior motives to nobler employments; the greater the difficulty and self-denying character of the labour, the more powerful, constant, and sustaining must be the stimulus. The noblest work requires the most unselfish men and the highest motives to actuate them, the ordinary motive of tradesmen — viz., money, would not sustain the scientific

discoverer nor the missionary in their self-denying occupations, partly because money is not entirely a suitable reward in such cases, and partly because very little or no money is to be obtained for such services; nor can fame be a chief motive in those still less selfish cases of profound scientific research, of which mankind cannot fully appreciate either the importance or the labour until many years after the death of the investigator.

Human motives differ greatly in strength, the more animal the motive the greater usually is its power; the moral and intellectual ones are nearly always the weakest; and this is a very necessary and good arrangement, because life and the means of living are the most imperative, and the more refined qualities are dependent upon them. Just as the automatic vital actions underlie and are more indispensable than the animal desires, so are the latter more necessary than the sentiments and intellect. It is largely because the baser motives are usually stronger than the moral and intellectual ones, that human beings commonly prefer selfishness to altruism, to obtain pleasure and avoid pain, to be paid than to pay, to receive than to give, to be helped than to help, to play than to work, to remain ignorant than to learn, to do everything in the easiest way rather than in the best one, to shift their own burdens to the shoulders of other persons, to commit crimes, etc., etc. The chief reason why two different men, placed apparently in exactly the same circumstances, behave very differently, is because they have different ideas which act as motives; and probably because the corresponding parts of their brains are not equally excitable.

The highest motives in human life are a constant sense of duty, unceasing obedience to great natural powers, a desire to do the greatest good, love of knowledge and of self-culture, willingness to make present sacrifice in order to ensure greater future good. Duty should come before self; in performing it a man should not always first think of his own interests, but of his duty. Life is often a curse to the man who neglects his duty, because it is usually followed sooner or later by failure, and frequently by remorse; but when duty has been performed, the chief happiness, viz., peace of mind, usually follows. Duty does not usually contemplate self-advertisement One great reason why a sense of duty is the most sustaining motive, is because it is always available and does not fluctuate, whilst that of money entirely fails at times, and that of fame is often capricious and too distant. All human objects are more or less speculative, and low motives are often fitful ones, this is well illustrated by gambling and speculations, "there's many a slip betwixt the cup and the lip," nevertheless, "nothing venture, nothing have." Those who act upon low motives usually disbelieve in high ones, largely because they do not understand them, also because high motives would fail in their occupations, "when men live in Rome they must do as Romans do"; an honest man could hardly live in a nation of rogues; the man who lives for self and money alone does not usually believe that another man can act essentially from a

desire to do the greatest good. He who acts from an expectation of eternal happiness in heaven, or a fear of endless torments in hell, employs a very selfish motive, and the powers of Nature often punish him with mental suffering caused by doubts respecting the reality of his objects.

In an imperfect state of civilisation, men necessarily prefer money before knowledge, small facts before great principles, and sectarian dogmas before truth, largely because money, small facts, and sectarian dogmas, make more direct impressions upon the senses, excite stronger personal desires, and are more easily perceived and understood—all this shows that the common source and basis of motives in untrained minds is imperfectly controlled desire. In a much more perfect state of civilisation, after the means of personal existence have been secured, men's motives may become:—knowledge before money, truth before belief, principles before facts, and morals before dogmas. Selfish motives are often in some degree justified by their effecting good objects; many persons would fail to do good if they did not believe:—"Blessed are the meek, for they shall inherit the earth";—"He that giveth to the poor lendeth to the Lord";—"Blessed are the merciful, for they shall obtain mercy";—"Repent and ye shall be saved," etc.

49. Self-Control, Self-Regulation, Selection, Choice, etc.

The powers of self-control, selection, and choice, have been repeatedly adduced as proofs of freedom of the human will; that of self-control, however, is possessed by many inanimate mechanisms; thus we have the self-regulating principle operating in musical boxes, gas regulators, water regulators, the balance wheels of watches, the isochronous pendulums of clocks, the self-acting governors of steam-engines, etc., etc. That the power of selection is also no proof of freedom of the will is shown by the actions of inanimate and animate bodies possessing no mind or volition. According to Sir D. Brewster, in the formation of crystals of apophyllite and analcime, laws operate more like those in living beings than in crystals (*Philosophical Magazine*, vol. v, 1853, pp. 17-27). By means of their roots, "plants take what they require from a mixture of salts, without reference to the composition of the nutritive mixture" (Dr. Sachs, "Physiology of Plants," 1887, p. 287). Microbes have the power of selecting their habitats and food; Pasteur found that by cultivating bacilli in an aqueous solution of racemate of ammonium, which we know is composed of equal parts of right-handed and left-handed tartrate of ammonium, those minute organisms attacked and decomposed the right-handed or ordinary tartrate and left undecomposed the left-handed one. Every definite material structure, whether animal, vegetable, or mineral, selects its own appropriate nutriment, even crystals of alum, of salt, of blue vitriol, and thousands of other inanimate substances choose their own suitable material from impure liquid mixtures without the aid of volition. In the

human body the bones select one set of substances from the blood, the nerves another, and the muscles similarly. Selection and choice depend largely upon the mechanical principle of "least resistance"; a man selects the easiest path through a crowd like a stream of water or a stone select the easiest course down a hill; men seek the easiest ways to effect their objects; they establish trades and manufactures in the most favourable localities; thus lace is made at Nottingham, needles at Redditch, etc. Man "is a machine capable of adjusting itself within certain limits" (Huxley, "Lay Sermons," p. 340).

Molecular motion lies at the basis of, and determines choice; it exists in all bodies, great or small, living or dead, solid, liquid, or gaseous; it excites vibrations in the universal ether, and these vibrations are communicated to other bodies and alter their properties and actions. Difference of molecular motion may be regarded as the essential cause of apparent comparison, judgment, choice, and selection in all bodies. Choosing necessarily implies rejecting, and each depends upon relative molecular motion; thus acids reject acids, and choose bases with which to unite, and bases refuse bases and choose acids. The whole of our organisms are filled with movements in the form both of unconscious and of conscious choosings and rejectings; bone, muscle, and brain are incessantly rejecting worn-out materials and assimilating new ones; bone "selects" the materials of bone, and brain the materials of brain, and "rejects" all others simultaneously. Those molecular movements within, and others from without, continually affect us whether we are willing or not, and directly determine our conduct; and the most we can do is to indirectly influence our choice by altering our environments. We know that a very large proportion of our acts of choice and rejection necessary to life are unconscious ones and occur incessantly during our sleep.

We often appear to choose when we only yield to the strongest cause; but the fact is, we are compelled to choose and to act upon our choice. Circumstances of pleasure as a result of obedience to natural laws, and of pain and unhappiness as the effect of disobedience, operate largely as regulators of our conduct, and supply motives which largely compel us to act rightly. The statement that "self-preservation is the first law of Nature" is not only largely true of living creatures, but also of inanimate substances; all bodies usually select that which is best for themselves. It is in obedience to natural laws that liquids and heavy substances appear to select the lowest places, but it is really the influence of gravity which determines them; gases and vapours appear to select the highest places through the same compulsory power. Acids appear to select alkalies with which to chemically unite, and on presenting proper proportions of two suitable acids to a suitable alkali, the latter will usually only unite with one of them. If a piece of zinc is immersed in a mixed solution of the nitrates of silver, magnesium, calcium, sodium, and potassium, it will select the silver only with which to construct a "metallic tree," and reject all the other metals; or if a crystal of a particular salt is placed in a suitable

mixture of saturated solutions of different salts, it only selects and assimilates to itself either particles of the same salt as itself, or of salts which belong to the same crystalline system. Living tissues, whether of vegetables or animals, usually select and assimilate from nutrient fluids, particles only of those kinds of matter dissolved in the sap or blood, which are suitable for the building up of the particular tissue; thus a bone selects and assimilates lime and phosphoric acid from the numerous different substances conveyed to it by the blood. The act of self-repair is clearly connected with this, and is not limited to living structures; thus Sir David Brewster observed that if a portion of a surface of a perfect crystal of alum was very slightly abraded by dissolving a film from it, and the crystal was then immersed during a very brief period in a saturated solution of alum, the abraded portion repaired itself. Many definitely formed inanimate structures have their own diseases and modes of self-repair. The subjects of "diseases of crystals" and of "malformation of crystals," have been scientifically investigated by Pasteur and others (see "Rejuvenescence of Crystals," by Judd, *Nature*, May 28, 1891, p. 83).

Apparent adaptation of means to ends is frequently seen in minerals, plants, and animals, thus a plant growing in a dark recess bends itself towards the light as if it preferred light, or its roots stretch out towards damp soil as if they selected moisture. "A sycamore tree at Penns, near Wolverhampton, sent down into a well, to reach the water, a root forty-four feet long" (St. George Mivart, "On Truth," 1889, p. 335). "A New England acacia, which had become languishing, after having exhausted the sterile soil in which it was planted, at last driven to quench its thirst, threw out one of its roots across a hollow of sixty-five feet in order to plunge it into a neighbouring well, and spread out its fibres in the midst of the water," . . . "after which it grew with marvellous rapidity" (Malherbe. F. A. Pouchet, M.D., "The Universe," 13th edition, p. 279). "Dr. Davy brought forward a case in which a horse-chestnut grew on a flat stone, the roots passing seven feet up a wall, then turning over the top of the wall, and down again seven feet to the earth" (*ibid.*, p. 280). "Insectivorous plants, like the Dionœa (Venus's fly-trap) select certain bodies which come into contact with them to the exclusion of others" . . . "The amoeba chooses in the same way certain organic fragments with which it nourishes itself" . . . "by a relation of molecular composition between what chooses and what is chosen" (T. H. Ribot, "Diseases of the Will," 1894, pp. 20, 21). A frog, immediately after being decapitated, jumps away from a source of irritation as if it still possessed sensation, volition, and choice.

Many plants avoid their enemies if they can. Some avoid light, thus many fungi grow in the dark, and are more like animals than the green plants, they inhale oxygen and exhale carbonic acid similarly to human beings; and require organic matter for support (A. Wilson, "Studies in Life and Sense," 1887, p. 323). One species of plants prefers what another rejects. Plants in general require iron, some more, some less;

much iron is indispensable to maize. Mercurialis much prefers nitre when mixed with common salt (*ibid.*). One plant of the violet family, Viola calaminaria and Thlapsi calaminaris, will only flourish where there is zinc in the soil (*ibid.*, p. 325, 341). Others, for instance, Utricularias (bladderworts), choose foul ditches and putrefying organic matter to live upon; fungi in general prefer decaying animal matter; and the butterwort feeds on insects (*ibid.*, pp. 328, 330). The Aethalium (flowers of tan), growing in tan-pits, absorb *solid* food, and creep about their habitations like the lower forms of animals (*ibid.*, p. 340). According to the late Dr. Daubeny, small quantities of arsenical sulphide in the soil have no injurious effect upon beans, barley, or mustard, and act as if they rejected it. In the process of grafting "of plants, those belonging to different natural families will not unite," . . . "unless the chemical processes in both plants are similar" (Dr. Schleiden, "Principles of Botany," 1849, p. 535).

In all the foregoing cases the selecting substance seems to act as if it possessed the powers of comparison, judgment, and volition, but the real cause is not volition, but natural energy acting in accordance with law, and the effect depends upon difference of impression, the strongest and most suitable influence determining. The vast number and variety of instances in which inanimate substances and plants appear to select the substances and conditions which most conduce to their existence and well-being, and reject others, indicate that the influence which determines the effort is an universal one, viz., molecular motion, and support the conclusion that it is the same as that which operates in man, and we should not without proper and sufficient reason assume the existence of a special occult power to perform the same function in him.

It is evident from the foregoing facts and considerations that our acts of choice are determined for us and through us by the operation of natural powers and laws, that science enables us to reconcile the apparently contradictory phenomena of free will and necessity, and that the extent to which our thoughts and actions are free, limits the extent of our responsibility.

50. The Scientific Basis of Human Control.

Why is it that man is the master of all other animals, and possesses greater general power of control and government than any of them? It is especially because his brain is more complex in structure and action than theirs, and is more developed in its intellectual portions. A man, in consequence of possessing more varied intellectual power than any other animal, is excited to action by a larger number of circumstances and reacts in a greater number of ways; he possesses a larger variety of means of offence and defence; it is largely because civilised men possess a greater variety of warlike appliances than savages that they are enabled to conquer

them; the defeat of the Dervishes at Omdurman is an illustration of this.

The same explanation which applies to his government of other creatures applies to that of himself, his cerebral reactions upon things include those which affect him from within, as well as from without, the chief seat of his intellectual controlling power is in his brain, whilst nearly all his so-called "internal" influences arise from his other organs, and are relatively external to it; he can alter the states of his internal organs and brain by means of suitable food, medicine, exercise, education, etc., and thus indirectly influence his body and mind. The greater the variety and the more fundamental the knowledge a man possesses of himself and of external nature, the better usually is he able to govern himself and things around him; all his ideas and all parts of his brain then act consistently together. The great variety of ways in which he can affect and be affected by external things, proves that he is himself controlled by Nature in accordance with the great scientific principle of action and reaction. These remarks are consistent with the fact that human energy and influence is extremely small in comparison with that of external nature. "Rational self-control is founded on and to be obtained by the adoption of rules of conduct; from a perception of their moral rectitude, which, acquiring through time the force of habit, render the desertion of our duties abhorrent to our nature" (H. Mayo, F.R.S., "Philosophy of Living," 1838, p. 282); "the adoption of rules of conduct" consists of a proper selection of environment, of mental education, and of obedience to all natural laws.

51. Human Responsibility, Fatalism, etc.

It has been shown by numerous and varied examples the universality of causation, and that in accordance with this law "whatever is must be," and that "we all do as we must." A superficial consideration of these statements would lead many persons to conclude that, if they were true, human beings would have no responsibility, and that if all men believed them they would all do as they liked, vice would increase, and there would be little or no restraint upon evil-doing. Such a conclusion, however, is erroneous, because it is based upon only a portion of the evidence; if all men believed in the universality of causation they would still act in nearly the same manner as they do now, and would not more, but less, extensively neglect the duties of life. The reasons for this are very simple: (1) because, having a better understanding of the omnipotence of natural energy and the inexorable nature of the law of causation, and knowing that punishment inevitably follows its infraction, they would be more careful to obey it; (2) because they would still be incessantly acted upon, day by day, hour by hour, and minute by minute, by nearly the same compulsory influences to properly carry out the objects of life as they are now; (3) because they would still be responsible to the extent of their freedom as they are

now, and whether they considered themselves to be so or not, they would still be treated by the forces of Nature and by their fellow-creatures as if they were so; and (4) if they did wrong, their fellow-men and natural powers would still continue to restrain and punish them. Whilst also the law of causation compels men to do as they do, that of evolution compels them to improve; and if they do not improve they are punished. Hitherto the effect of extension of scientific knowledge has been to make men more law-abiding instead of the reverse. It is well-known that scientific men are law-abiding, and that ignorant persons are often lawless. All this, and much more evidence which might be adduced, shows that the sense of human responsibility is not diminished, but increased, by extension of scientific knowledge.

And with regard to any fear that belief in scientific causation leads to fatalism, we know that causation only acts when all the necessary conditions are present, but that fatalism is independent of all conditions; that whilst we are governed by omnipotent powers and inexorable laws, we possess a certain amount of freedom of action, and therefore of responsibility (see section 47). There can be no reasonable objection to such a degree of fatalism as constrains us to do what is right; and science informs us that we must submit to sufficient coercion and pain to induce us to obey the great laws of Nature, and to personally improve so far as our freedom permits. Our responsibility is directly and largely proportional to our knowledge and ability; it is the most ignorant and incompetent man who is the least free and the least responsible for his wrong-doings; babies and idiots have but little freedom or responsibility.

These explanations largely reconcile the apparently contradictory doctrines of free will, responsibility, necessity, and fatalism; and the chief practical difference of effect which the adoption of the scientific view of these matters would have upon the ordinary conduct of men would be to make men more law-abiding, more charitable and forbearing towards each other, to put more rational restraint upon wrong-doing, and to be more contented in bearing the unavoidable ills of life.

The fact that human volitions are determined by causes does not necessarily lead to an injurious degree of necessity: "Necessity simply says that whatever is, is, and will vary with the varying conditions. Fatalism says that something must be; and this something cannot be modified by modification of the conditions" (quotation from G. H. Lewes by C. L. Morgan, "Springs of Conduct," 1885, p. 277). That man is free to think and to act is perfectly true, but it is only within certain limits; and the same may as truly be said of all living things and all inanimate ones. He is free, and not free, and both contentions are true, but under different conditions and circumstances; he is free only as far as his conditions and circumstances permit him.

52. Knowledge.

"Thou wert my guide, philosopher, and friend."
—*Pope.*

The test of knowledge is the test of truth.

Knowledge is "the certain perception of truth"; "belief which amounts to, or results in, moral certainty"; beliefs, however, are not always knowledge; knowledge is that which is known, which is certain, and not that which is merely believed, and which may be true or false; ideas and opinions are not necessarily knowledge. All knowledge is based upon consciousness. What are called "unthinkable ideas," if there are any, are not knowledge. Knowledge, according to Locke, "is the perception of the connection and agreement, or disagreement and repugnacy, of any of our ideas"; all ideas which are inconsistent with known truths are not knowledge; we cannot know contradictions, though we often believe them. To know a thing, is especially to know its essential properties and relations, because "the inmost nature" and the very existence of a thing consists of those qualities; a thing "*is* its relations. Therefore, to ask what are its relations to an unknowable is absurd" (G. H. Lewes, "Problems of Life and Mind," 1874, vol. i, p. 64). Ideas which have no relations to known truths are not knowledge but merely impressions; all knowledge is natural, there cannot be any supernatural knowledge (see section 4); unprovable ideas or beliefs of any kind are not knowledge, but only hypotheses; an imaginary idea may, however, if it happens to be a true one, become knowledge by sufficient verification. "The touch-stone of knowledge is prevision" (G. H. Lewes). A verified hypothesis or true theory is one which is perfectly consistent with all known truths. As we cannot directly survey our own consciousness, we do not directly know our own existence, but are compelled to infer it from other evidence; we only know that we exist because the inference is consistent with all known truths, including all our experiences. There are many profound truths which we only know in an indirect manner by means of inference, such as the ideas of existence, time, space, universal motion, the abstract ideas of universal continuity, causation, evolution, etc. It has been stated that "we cannot be said to know anything until we know how it has become to be what it is" (Rev. J. M. Wilson, "Essays and Addresses," 1887, p. 137); but this statement is not quite correct, because even if we only know a fact or that a certain thing merely exists, we possess one of the most important points of information respecting it; we may perhaps never know its origin, or how it was produced. The chief aim of philosophy is to produce a theory of knowledge.

Knowledge is cosmopolitan; "the spirit of an age is its knowledge"; it is also a commodity sold by teachers, professional men, and experts. Knowledge is ever-expanding. The best corrective of intolerance and bigotry is comprehensive knowledge and wisdom. "Seek knowledge and get understanding" (Solomon). He who has plenty of good ideas is never alone. "A man is what he knows" (Plato). Knowledge of great truths illumines all upon which it falls. "He who opens a school closes a prison" (Victor Hugo). Knowledge of parts is necessary to that of the whole, and of the whole to that of its parts. "Scientific knowledge is a true revelation from the infinite source of all truth. Knowledge is, so to say, the present stock or capital with which science works. Science cannot exist without it. The object of science is not only to increase and enlarge knowledge but also to purify the present stock of knowledge from vagueness, error, and misconceptions" (*The Open Court*, No. 131, p. 2121). "Science is a cure for smallness of mind" (Condorcet). Every victory of science discloses further objects of conquest. The great principles of science are the true "light of the world," and have been evolved, not by one man, but by hundreds of thousands of original investigators and thinkers. Modern science, or the experimental method of discovery, dates roughly from the times of Galileo and Harvey, say about the year 1600 (*Nature*, October 28, 1897, p. 621). "Science is the grand corrective of the laxness of the natural man in receiving unaccredited facts and conclusions . . . it saps the credit of everything that is affirmed without being properly attested" (Professor Bain). Increase of right knowledge tends to increase of right conduct. A man who has knowledge is less ready to do wrong because he foresees its evil consequences. A man who neglects to acquire knowledge is dangerous to himself and to others. He loveth best who knoweth most. It was said by Göethe: "The greater the knowledge the greater the doubt," and it is quite true the larger the knowledge of scientific principles the larger the doubt of dubious statements and of dogmatic assertions; but the state of doubt respecting the certainty of fundamental principles is very much less with scientific philosophers than with unscientific persons—"To the solid ground of Nature trusts the mind that builds for aye" (Wordsworth). The scientific hypotheses of one age often become the verified certainties of the next, but hypotheses of the supernatural live only until science disproves them, and then gradually decay.

> Great thoughts yield immediate pleasure,
> And good ones are a priceless treasure.

We extend knowledge by the discovery and accumulation of facts, and we condense it by means of principles, general truths, and laws. Whilst details are necessary for common daily use, philosophy aims at unity and comprehensive ideas for wider scientific purposes. Original thinkers and discoverers require extended language in order to render knowledge

explicit, and present terminology becomes imperfect as knowledge enlarges; a good-sized dictionary is already required for the terms used in the subject of electricity alone (see Houston's "Electrical Dictionary"). "The commandment of knowledge is higher than the commandment over the will; for it is a commandment over the reason, belief, and understanding of man, which is the highest part of the mind and gives law to the will itself. For there is no power on earth which setteth up a throne, or chair of state, in the spirits and souls of men, and in their cogitations, opinions, and beliefs but knowledge and learning" (Bacon). "Experience teaches fools, and reason wise men." Roger Ascham said: "Learning teacheth more in one year than experience in twenty; and learning teacheth safely when experience makes more miserable than wise. He hazardeth sore that waxeth wise by experience. An unhappy shipmaster is he that is made cunning by many shipwrecks; a miserable merchant that is neither rich nor wise but after some bank routs. It is costly wisdom that is bought by experience. We know by experience itself that it is a marvellous pain to find out but a short way by long wandering. And surely he that would prove wise by experience, he may be witty indeed, but even like a swift runner, that runneth fast out of his way, and upon the night, he knoweth not whither." "Experience is a dear school, but fools will learn in no other" (B. Franklin); *i.e.*, they will not read good books, nor be convinced by argument—the conclusion to be drawn from these remarks is, get your knowledge cheaply but honestly, and do not make risky or costly experiments unless they are necessary:—

> We each should try to bring within our ken,
> The ways of greater things as well as men.

Various writers speak of a mysterious something which lies "beyond all phenomena," as if that something was supernatural or essentially unknowable, but it is usually in consequence of ignorance of great natural truths and principles that this idea arises; all that the idea should indicate is, that we only know a minute portion of what is capable of being known, and that there exists vastly more to be known, so that nearly everything is necessarily in some degree occult and mysterious. There is no substance of which we yet know the whole of its properties and applications; there are, however, some parts of our knowledge which are practically complete, for instance, if our astronomical knowledge was not essentially complete in some particular cases, eclipses, transits, occultations, etc., would not occur at the predicted times. As only a portion of our knowledge is in a sufficiently perfect state to be used for successful prediction, the remainder has necessarily a certain degree of mystery and uncertainty attached to it which excites inquiry. It has been said that "the tree of knowledge is not that of life," but this is not true generally, because knowledge often enables us to preserve our lives, nor is it true of the knowledge which enables us to successfully predict, because certainty of knowledge of events

beforehand is a great means of preserving life. Knowledge is in some sense even more essential to life than physical food, because without it food could not be obtained.

Knowledge is that which is acquired by experience, or is extracted from the results of experience by means of inference or other intellectual methods; and we can only acquire a little at a time. It is the study of the comparative sciences which yields the most comprehensive knowledge. All knowledge comes originally from sensation and hereditary instincts and tendencies. "All the phenomena of Nature are, in their ultimate analysis, known to us only as acts of consciousness" (Huxley, "Lay Sermons," p. 341). All knowledge and experience have been divided into subjective, or that of our feelings and ideas, in our nerves and brain; and objective, or that of things external to them; but both are nervous impressions, and there is no essential difference between them. Failure, doubt, and detection of error frequently lead to knowledge. Eminence in learning is often costly; there is no easy road to valuable information, we do not instantly learn what is right by means of untrained "conscience," nor by a sudden process of "inspiration," or of "conversion"; real saving knowledge of great scientific principles and of the moral rules which are founded upon them, usually takes a long time and much self-sacrifice to acquire; we may, however, obtain a more or less sudden perception of our ignorance and error, and a consequent desire to improve, but sudden great improvements are often only temporary and superficial, because it requires much time in which to seriously and fundamentally alter. Experience is a process of observing, learning, and knowing; we must observe, believe, or know, before we can conceive or infer. No one can become learned without passing through the various stages of ignorance necessary to prepare his mind for more comprehensive knowledge; it would therefore be irrational to expect men to acquire knowledge of the great principles of science without previous experience of all the necessary preliminaries. The most learned teachers are not always the most suitable ones to instruct the very ignorant, because many of the terms they find it necessary to employ are not understood by untrained persons; a gradation of teachers is necessary to suit a gradation of learners; learned lecturers require intelligent hearers.

It has been stated that—"All proof, all knowledge, ultimately rest on faith" (J. J. Murphy, "Scientific Bases of Faith," 1873, p. 99). "Faith, not knowledge or argument, is our principle of action" (Cardinal Newman, "A Grammar of Assent," 1870, p. 93); the proper basis of knowledge, however, is not mere faith, but suitable and sufficient evidence, *i.e.*, evidence which is consistent with all known truths, the faith being based upon it. Ideas which are based on faith alone are not knowledge, but only beliefs or opinions; and faith which is based upon unprovable assertions is dangerous and sometimes criminal. It has also been said that, "the largest part of our knowledge is verified by assumptions which cannot be proved" (J. J. Murphy, "Scientific Bases of Faith," 1873, p. 118); but unprovable assumptions cannot verify any statement, simply because they

cannot themselves be shown to be true. According to another writer (Rev. J. Martineau, "Faith and Self-Surrender," 1897), "*Natural faith* is the essential root of all knowledge." "By *natural faith* I mean the assumption *that a Divine Perfection is the everlasting basis of all things*" (*ibid.*, pp. 10, 11); but science would say, that not mere faith, nor assumption, but proper and sufficient evidence, consistency with all known truth, "is the essential root of all real knowledge." Ideas based upon faith are not knowledge, but only beliefs; often lazy beliefs, not honestly earned. Faith should be based upon knowledge, and not knowledge upon faith without evidence. "Many who talk very much of religion and conscience, of church and faith, of power and right, of obstructions and humours, melancholy and choler, would perhaps have little left in their thoughts and meditations if one should desire them to think only of the things themselves, and lay by those words with which they so often confound others, and not seldom themselves also" (Locke); such persons would find a foundation of scientific principles very much better than faith, or than "a deluge of words poured over a desert of ideas" (Helvetius). Such theology without science is not much worthy of reliance.

The desire for knowledge, like that for all other things, is a species of nervous unrest. It is well-known that human curiosity is in some persons insatiable, that no sooner have they had one inquiry satisfied than they want another. We are, many of us, prompted to wish for knowledge in a similar manner that we are to desire food, in the former to satisfy the needs of the brain, and in the latter those of the body; making allowance for periods of abstinence, the more we know and consume the more we want to know and consume; human desire is like a fire, it increases by what it feeds on. This is a general property of all intelligent animals, all are more or less curious, have inquiring minds, especially when in search of the means of existence, food, shelter, warmth, society, etc., and this search is constantly recurring. The same tendency continues on downwards from the purely intellectual into the purely animal actions; all parts of the human organism seek their appropriate excitants, the brain requires oxygenated blood and stimuli, the nerves nutriment and excitement, the stomach craves for food, the muscles exercise, the blood its necessary ingredients. It also passes still lower down into unconscious actions in plants, thus the roots of trees reach out towards moisture, the leaves towards light, etc. Even crystals select their proper materials from mixtures; and the basis of all curiosity and desire may be traced still farther downwards into the invisible movements of molecules and the vibrations of the universal ether which excite them and are in turn excited by them. The needs of inanimate things, and the wants of animate ones, largely merge into each other.

Why are mankind so insatiably curious after knowledge? It is largely because it is necessary to their existence, life must be maintained, and gratification of desire is an indispensable necessity of life; we cannot determine our movements, obtain or select our foods, avoid poisons and

sources of danger, without the requisite knowledge; it is also largely because we personally wish to avoid pain, enjoy pleasure, or reap some advantage. Men of science are uneasy about a fact until they can explain and classify it. Curiosity is a laudable desire when it is rational and controlled by the intellect; but it is a selfish and immoral one when governed by feeling in opposition to reason. It is especially laudable when we make great personal sacrifice to obtain new knowledge for the good of all; but it is selfish when we wish to obtain it solely for ourselves at other persons' expense. It is usually the most gifted of men who have the least selfish love of knowledge. The more ignorant a community the more does it seek to gratify curiosity without making the necessary self-sacrifice, the more irrational also are its questions, and the more it accepts and believes gratifying assertions without proper and sufficient evidence. Broad is the road to irrational desire, and many persons who travel by it are willing slaves to untruthful and selfish ideas,—

> "Must struggling souls remain content
> With councils and decrees of Trent?"
>
> —*Longfellow.*

There is knowledge which we ought to possess, and that which we ought not to possess, similarly as with any other useful property. Many persons wish to secure important knowledge without incurring the cost of experiments or the trouble of study, and especially to obtain scientific answers to the most complex and profound personal questions. To give even a list of examples of irrational curiosity would fill a volume. Some persons ask, and others venture to say "what heaven is," and call it "a new home for us in other worlds," and "a fact which we believe; the details are not revealed to us";—"that place where they neither marry nor are given in marriage";—that "they who live there are the angels, and just men made perfect, and the spirits of the saints in light" (F. W. Farrar, "Words of Faith and Wisdom," 2nd edition, pp. 131, 132, 134), without first ascertaining by means of proper and sufficient evidence that "a heaven, angels, and spirits of saints," really exist. Similarly also, of numerous questions respecting hell, a devil, demons, the intercession of saints, etc., etc. Search for evidence is the most proper method of satisfying a desire for knowledge.

All knowledge consists of ideas, and has a physical basis consisting of some kind of cerebral impressions, and the greater the number and variety of truthful impressions the greater the extent and variety of knowledge. There is no knowledge without a difference of mental perception. "I know that I know, is two perceptions." Knowledge and thought arise from a mental perception of difference between two or more impressions; we realise an idea by means of contrast with some other idea, and our perception of identity of two ideas is a result of their identity of impression when compared with each other and with the different impression

attending a third dissimilar one. Knowledge of difference is as certain as that of identity. "Nothing but Nature can qualify a man for knowledge," *i.e.*, he must have a receptive brain, made so either by hereditary influence or by training.

All our knowledge is relative, and all portions of it are directly or indirectly related by the bond of continuity to all other portions; relative knowledge is all we can obtain and probably need. As all the phenomena of which we possess any knowledge happen in time and exist in space, all our knowledge is related to those conditions; and as there is no known beginning of time nor any known fixed point in space, we possess no known fixed or absolute data to which we can refer our ideas. Our nearest approach to absolute knowledge is to be found in the three "axioms of logic," viz., "whatever is, is,"—"a thing cannot be and not be," and "a thing must either be or not be," to which may be added, "whatever is, must be"; "a thing is not in two places at the same time"; "two things which are equal to a third are equal to each other"; "a whole is greater than its parts," there is not a "negative mass," or less than nothing, etc. Continuity is an essential attribute both of time, space, and causation; complete knowledge is essentially continuous, this is seen in the "ascent of man," the history of the world, and of man, and in history generally. Knowledge is largely indestructible, men give to their descendants in writing that which will not readily decay. Practically speaking, the evolution of knowledge is endless, and of its beginning we know very little; we go on and on, ever striving towards an end but never reaching it. All that is or can be true respecting universal matter and universal energy, is essentially knowable, because it includes properties and relations, which either directly or indirectly affect us. Mankind as yet is in its youth, and knows but little of all truth:

> "Throughout the endless ages, increasing purpose runs,
> And the course of knowledge widens with the process of the suns."

The foundations of all real knowledge lie in the continuity and infinity of time, space, and motion; if these conditions were intermittent or could not be infinite in greatness and in smallness, all natural phenomena and the possible knowledge respecting them would be similarly limited. As we can neither know nor even imagine the infinitely great nor infinitely small, either of time, space, matter, motion, or the universal ether, but only know an extremely minute fraction of the possible knowledge of either, we must be content with this and wait for the remainder; and as the conclusion that each of them is infinitely great in extent, and capable of subdivision into the infinitely small, agrees with all known truths, we are morally bound to believe and have faith in their infinity.

The limits of our knowledge circumscribe our notions of a Deity; it is a mistake therefore to suppose that science has no relation to religious doctrine; the real "over-ruling Providence" is omnipotent and universal

natural energy acting in accordance with immutable laws. Men's ideas of God vary in comprehensiveness with the width of their experience and information; persons who know but little of the infinity of time and space as revealed by geological, cosmical, microscopic, and optical discovery, the omnipotence of energy as shown by astronomical and other great natural phenomena, the omnipresence of motion in all substances as disclosed by scientific research, the immutability and universality of law as established by such investigation, the ceaseless expansion of happiness by the gradual increase of scientific knowledge, can have comparatively only a very narrow conception of the attributes of the God they worship. "There is more religion in science, than science in religion" (Thoreau). True religion is dependent upon real knowledge, and can only advance as science is evolved; the disregard of scientific principles therefore is irreligious, and is especially conspicuous in books written by "religious" persons; and we may remember that a man may study a subject in such a narrow manner during the whole of his lifetime, as not to learn much about the chief truths upon which it depends.

With respect to what is termed "knowledge of God"; as the human mind is extremely finite, and a single person is unable to comprehend even a million millionth part of all possible knowledge, and as the God of Christian theologians is asserted to be everlasting, infinite, omnipresent, omniscient, omnipotent, infinite in wisdom, justice, love, etc., our minds must necessarily be incapable of realising a complete idea of such a Deity. Descartes said: "By the name of God I understand a substance, infinite, eternal, immutable, independent, all knowing, all powerful, and by which I myself, and every other thing that exists, if any such there be, were created" (H. Calderwood, "Handbook of Moral Philosophy," 1875, p. 227). It has been asserted that "God is the cause of causes." According to Leibnitz, God is the monad of monads. The original idea of God was that of a great ruler (Calderwood, p. 229). "If the Deity be the source of all dependent being, which exists only because he wills that it should, how does He permit the outbreak and continuance of moral evil? This is one of the darkest and most perplexing problems of moral philosophy" (*ibid.*, p. 226). The mental impossibility of even imagining such a Being has been generally recognised by theologians themselves, thus Dean Mansel in his book on "The Limits of Religious Thought," states that, "The conception of the Absolute and Infinite, from whatever side we view it, appears encompassed with contradictions. There is a contradiction in supposing such an object to exist, whether alone or in conjunction with others; and there is a contradiction in supposing it not to exist. There is a contradiction in conceiving it as one; and there is a contradiction in conceiving it as many. There is a contradiction in conceiving it as personal, and there is a contradiction in conceiving it as impersonal. It cannot without contradiction be represented as active; nor, without equal contradiction, be represented as inactive. It cannot be conceived as the sum of all existence; nor yet can it be conceived as a

part only of that sum" (*ibid.*, pp. 58, 59). "How can Infinite Power be able to do all things, and yet Infinite Goodness be unable to do evil? How can Infinite Justice exact the utmost penalty for every sin, and yet Infinite Mercy pardon the sinner? How can Infinite Wisdom know all that is to come, and yet Infinite Freedom be at liberty to do or to forbear? How is the existence of evil compatible with that of an infinitely perfect Being? for, if He wills it, He is not infinitely good; and if He wills it not, His will is thwarted, and His sphere of action limited" (*ibid.*, pp. 50, 51). According to theological doctrines, the idea of God is an embodiment of all the infinities, thus He is "everlasting," or infinite time; "omnipresent," or occupies all space; "omniscient," or possesses all knowledge; "omnipotent," or includes all energy; "all-seeing," or has an infinite organ of vision; "infinitely wise," and therefore possesses an infinite brain; "immutable," or embodies universal laws; "God is truth," and therefore absolutely certain; He is also "infinite in justice, mercy, love," etc. He is further said to be "unknowable"; Dean Mansel in a quotation states that "the Supreme Being is one whose nature cannot be expressed in any language, for He is above every name that is named; He cannot properly be even said to exist, for He cannot be identified with any one thing that exists; He is rather to be called non-existence" ("The Gnostic Heresies," pp. 146, 147; T. M. Herbert, "Modern Realism Examined," 1879, p. 395). If He is "unknowable," a "non-existence," and man cannot realise an idea of such a Being, He is to man an infinite nothing or vacuum which no man can rationally worship; but a man can reasonably worship truth because it is real. According to the late Cardinal Newman, "conscience teaches us, not only that God is, but what He is" ("A Grammar of Assent," 1870, p. 385); theology contains many such unprovable assertions, and one of its writers recommends us to "let it remain in the vague." These various statements prove that the idea of God as entertained by theologians is very unscientific, and does not possess the characteristic of real knowledge. Several of the orthodox ideas of God also flatly contradict each other.

As time, space, matter, and motion are, so far as we know, infinite, so also must the possible limits of knowledge be. Every physical fact must in itself be capable of complete explanation, because it is a reality in time and space, and possesses relations to other facts and to the human mind. As there is no known limit either to time or to space, and knowledge is always increasing, there is no definite boundary to our future possible knowledge, except that of perfect consistency with truth, and of the capacity of the human brain to receive, co-ordinate, and retain ideas. Who would have thought, one hundred years ago, that we should ever know the chemical composition of the sun and other heavenly bodies? or be able to see through opaque substances? Yet all this, and very much more, equally wonderful knowledge has been acquired. The application of knowledge in evolving greater knowledge, as in applying the great truths of science to the explanation of human conduct, is like the gradual unfold-

ing of a great drama, or the slow dissipation of a great mist disclosing a grand panorama of beautiful scenery. The perceptible boundary of human knowledge is continually retreating as we advance; but every increase of information confirms the conclusion that we are very slowly advancing towards an ultimate one. At present we know only an extremely minute proportion of all possible knowledge; we have as yet merely scratched the surface of the earth or penetrated "skin-deep" into anything, except some limited sections of science; we know directly only a very minute fraction of the universe; of our own globe we know comparatively little, and of the millions of distant worlds in space we know vastly less. We only directly know that which is finite, our minds are altogether too limited to completely realise the absolute, the infinite, the endless, the eternal, and we know virtually nothing of creation or annihilation of matter or energy. Of the greatest of all existences, viz., the absolute uniformities of time, space, the universal ether, and universal molecular motion, we have no direct knowledge by means of our senses, and we only know through our reasoning powers that they really exist. We cannot directly perceive any past or future event; but by history we know the former, and by means of inference we may with certainty know many of the latter and of the former, as in the case of eclipses, transits, etc. We know with such certainty and completeness, a great many of the properties of material substances, that we can by the aid of mathematical and other knowledge deductively infer from them a vast number of new consequences in the form of predictions, which subsequent trial and observation prove to be correct. Our knowledge of an event or phenomenon usually decreases directly as the distance in time and as the square of the distance in space which separates us from it; of the ancient history of man, of the most remote events in time, and the most distant heavenly bodies in space, we know but little; and of the beginning of time or thought, or the limits of space, we know little or nothing:—

> "Where is the land to which the ship would go?
> Far, far ahead, is all her seamen know."
>
> "What is their future few can see,
> A prophecy and intimation,
> A pale and feeble adumbration,
> Of the great world of light that lies
> Behind all human destinies."
>
> —*Longfellow.*
>
> "And these are ours to-day! The boundless flood
> Of infinite Research—the ocean vast
> Of endless exploration—and our barque
> Of Science builded—by Reason piloted—
> Sails forth upon the venture—and to us,
> To search the shores of Doubt—in midnight hid;
> To give, if such there be, new worlds to light,
> And that we have, with better-day make bright."
>
> —*J. H. Dell.*

Knowledge is like a circle; when we arrive at the limit of what is known, any further discovery only extends that limit and increases the apparent extent of that which remains to be known. When we arrive at the present boundary in almost any subject, we want to know what is beyond, we want to know the first causes, the beginnings of all things, forgetting that there can be no first causes, beginnings or endings, in an infinite series of changes or of causes and effects. Inquiring minds continually want to know the origin of evil, of man, of life, of a crystal, of imaginary things, and of every conceivable phenomenon, real or unreal.

> "In parts superior what advantage lies?
> Tell (for you can) what is it to be wise?
> 'Tis but to know how little can be known;
> To see all other's faults, and feel your own."
>
> —*Pope.*

If our thought could directly survey itself, our consciousness perceive itself, and each faculty and sense contemplate its own most essential properties and relations, then would our knowledge be greatly and rapidly increased. But all such knowledge is even now being gradually attained indirectly by means of scientific methods, and in a more satisfactory manner; for, like "he who hasteth to get rich shall not be innocent," so he who hastes to get knowledge without working for it, or diffusing it, mars his own goodness.

Knowledge, in consequence of its not being a material substance, is more free than the air; a person possessing it can neither be dispossessed nor readily dispossess himself of it—he who steals it takes that which cannot be returned. Published knowledge is usually public property, except in certain cases. These circumstances are connected with a great many phenomena materially affecting the welfare and progress of mankind; thus we all learn largely at each other's expense, and all men must diffuse knowledge whether they are willing or not. One general consequence of this is, that nearly every person takes without hesitation all the knowledge which lies within his reach and uses it for his own advantage, irrespective of whether it is the property of another person or not. Usually, the scientific man fares badly in such cases in a pecuniary sense in comparison with the man of business; thus, his published knowledge is universally taken. In very many cases of knowledge which rightfully belongs to them, manufacturers are largely at the mercy of those who have access to their works, and countless instances could be mentioned of the ways in which knowledge escapes from their grasp. Many a process which has cost a manufacturer a very large sum of money to develop and perfect has been carried out of his works by workmen and others and communicated to rival manufacturers; and no art, ingenuity, method, or contrivance, can effectually prevent it. In many cases those who are employed in the manufactory make careless remarks outside, or they boast of their doings

and the parts they perform in the private processes; or strangers have necessarily to be admitted to perform exceptional work; and in others, rival manufacturers attract the workmen into their employ by greater pecuniary inducements; and it finally comes to this, that wherever there is a secret it is sure to come out and ultimately become public and appear in print. Even processes which are patented become public property in a very few years. These are some of the ways in which men, whether willing or unwilling, are compelled by the operation of natural influences to share their knowledge with each other, and help to diffuse it. Honest thinkers and writers often unconsciously use other men's ideas.

All knowledge whatever is limited by consistency, and we may safely affirm that any statement which is not consistent with all known truths is not knowledge, but only opinion or false assertion. Further, as all real knowledge hitherto acquired has been found to be either directly or indirectly related to all previous knowledge, we may conclude that this characteristic is universal, that all undiscovered realities are related to it, and that any statements which are not so related are not knowledge; according to this view, all that is essentially unknowable and unprovable is untrue. Tested by these universal principles of consistency and relation, we may safely affirm that there exists no "supernatural knowledge." We can know no more than we experience through our senses and feelings under the greatest variety of conditions, plus what we inherit, and what we can extract from our experiential and inherited knowledge by means of intellectual processes; in this sense, all our knowledge is limited by our consciousness. It has been repeatedly said that we cannot know "things in themselves," or their essential nature, but this is not exactly correct, every additional amount of real knowledge we gain respecting a body or substance, its molecules and atoms, and their modes of motion is so far knowledge of "things in themselves," and more or less of their essential nature.

It is not so much the kind of problems presented by Nature as their great degrees of complexity and abstrusity which baffle our powers of research; and we have reason therefore to believe that it is not a defect in kind of our senses and mental capabilities but only their finite power and extent, which limits our acquisition of natural knowledge. As, however, knowledge is continually increasing in clearness and its attainability expanding by means of classification and the discovery of general laws; and as the powers of the senses and mind are continually rendered more efficient by instrumental appliances and arrangements, by improvements in method and discipline, and as even an instrument of finite power may in infinite time produce a comparatively infinite effect, it is hazardous to set a limit to the possible future capacity of the human mind; and it is reasonable to suppose that there is nothing in our mental constitution which will essentially prevent our attaining an almost unlimited degree of intellectual power. When in any case we have co-ordinated facts and extracted from them all the knowledge they contain, we have secured them and may dismiss them from our thought,

and thus relieve our memory. As everything in Nature is rational, it must be intelligible; but to be able to know all things without co-ordinating facts would require a brain incomparably larger than man possesses.

In some respects the bounds of possible knowledge appear to be not perfectly unlimited. We know that contradictions cannot co-exist, that phenomena which contradict the great principles of science, such as creation of energy, cannot be and need not be sought for, and that the number of forms of energy and of elementary substances is not very great; at the present time we are only acquainted with about half-a-dozen of the former and six or seven dozen of the latter. Elementary substances also do not appear to unite together in every proportion by weight, but only in certain definite ones, as if under ordinary conditions all other variations were impossible. But our science is only that of this globe alone, and consequently of its limited conditions of pressure and temperature, and it is probable that under different conditions in these respects, such as exist upon the surface of the sun, in the interior of the earth, and in the extreme coldness and almost infinite rarefaction of space, many compounds entirely unknown to us may be possible. At an extremely low temperature chemical action is already known to be greatly diminished, and that neither potassium nor phosphorus unite with liquid oxygen (Dewar). Not only does it appear highly improbable that an unlimited variety of chemical compounds can be, but we know that certain combinations and arrangements of forces, and the compounds and properties due to them, cannot co-exist. From these considerations there is probably a limit to the possible numbers of substances and phenomena, and consequently to the amount of possible knowledge respecting them. The number of laws also which govern a finite number of bodies and conditions must themselves be finite. According to the principles of geometry, there cannot be more than five regular solids, and this, according to C. Fourlinnie, appears to limit chemical union and the number of possible chemical compounds (*Chemical News*, October 2, 1896; also J. Bayma, "Molecular Physics," 1866). As there cannot be many truths, principles, or laws which are universal, the number of great discoveries yet to be made is relatively small. We know that there are statements in logic which are contradictory, mathematical expressions which are irrational, geometrical conditions which are inconceivable, mechanical arrangements which are mutually annulling, and physical motions and properties which are incompatible. The sciences also supply various problems which are insoluble, such as the arithmetical expression for the square equal to a circle or an ellipse, trisection of an angle; duplication of a cube, an *elixir vitæ*, etc. All these statements show that there are natural limits to knowledge.

The knowable unknown is at present incomparably greater than the known; we probably do not know a million millionth part of all possible knowledge; the scientific discoverer therefore is never in the position of Alexander the Great, with "no more worlds to conquer." "How little is all that which is seen and known to that unseen universe which we can

never know in its essential nature and completeness, unless we, too, become gods, and infinitely transcend the present limitations of our known faculties" (*The Open Court*, No. 21, p. 571). The unseen universal ether is a practically infinite ocean of future discovery. Berthelot calculated the number of chemical compounds which may be made of acids with certain alcohols, and said, "If you give each compound thus possible a name, and allow a line for each name, and then print one hundred lines on a page, and make volumes of one thousand pages each, and place a million volumes in a library, you would require fourteen thousand such libraries to complete your catalogue." If certain alcohols alone can yield so great a number of compounds, what an incalculable number must all other substances be able to yield?

We do not create knowledge; all the ideas we possess are at the outset derived from experience, and out of them a further amount of information is extracted by means of suitable intellectual processes, but we cannot extract from them anything which is contradictory to known truths. We cannot extract from anything more than it contains, whether it be material substance, energy, or knowledge; nor whether it be by means of chemical analysis, physical or mental methods. We usually first acquire ideas by observation, reading, conversation, travel, or by meditative and experimental research; we then form general truths by collecting together similar ideas into separate groups, and, by means of comparison and inference, we extract from these other truths in the form of conclusions; thus, our first and crudest kind of knowledge is observational, the next is comparative, and after that the inferential and analytical. Seriousness and attention are essential conditions of acquiring fundamental knowledge, and therefore of becoming wise, moral, and truly religious. By means of quiet meditation, and the employment of these methods, even our present stock of ideas is capable of yielding a vast additional number (see "The Art of Scientific Discovery," 1878, chapter 36, Longmans & Co.). As the various truths implicitly contained in a single statement are rendered more explicit by means of inference, so does the knowledge contained in it become capable of being perceived; the process is sometimes incorrectly termed "creation of ideas," because it is often so quickly performed as to be imperceptible, second, because the ideas evolved often do not manifestly appear to be contained in the original statements, and further, because we cannot easily watch our own thoughts. The evolution of knowledge by mental processes is not mere repetition; thus, whilst we gain no fresh knowledge by saying 8 is 8, we do gain some when we say that 8 is equal to 4 multiplied by 2, because it evolves the additional idea of equivalence, etc.; similarly if we say all metals are conductors of electricity, copper is a metal, therefore it is an electric conductor, although it does not create knowledge, it renders explicit by a new form of statement an additional idea, viz., copper is a conductor, which was previously only implicitly contained in the first form of expression. For an illustration of the large amount of knowledge which can be extracted by means of

inference from a simple comprehensive sentence in comparison with that from a narrow one (see *ibid.*, p. 334, *et seq.*). We no more create knowledge than we do matter, energy, properties, or relations; ideas or mental impressions can only be evolved out of previously existing ones, and as knowledge is essentially dependent upon cerebral impressions, and those impressions can only be produced by expenditure of energy, it necessarily follows that we cannot create knowledge even by the expenditure of cerebral energy.

Different scientific statements contain different quantities of latent knowledge; this is proved by the fact that we can evolve from them different amounts of information by means of suitable intellectual processes. The actual amount which can be extracted from any given statement varies with the degree of its comprehensiveness; the more general the proposition the larger is the quantity of knowledge contained in a latent state in it; for instance, a larger number of inferences can be extracted from the great law of gravitation, or from any other fundamental statement in science, than from any truth of a less comprehensive character. It is in consequence of this circumstance that the leading truths of science are the chief guides of life. The scientific knowledge gained directly from Nature by means of our senses is not that of general laws or principles, because our senses cannot directly perceive them; but usually of much smaller facts, in the form of ideas of substances, properties, conditions, and various other phenomena; and it is by classifying, generalising, and drawing inferences from those facts by means of the "inductive" and "deductive" processes, that we evolve from them a knowledge of principles, laws, forces, abstruse truths, and new deductive facts. Without suitable and adequate knowledge of small truths we cannot inductively arrive at great ones, and without knowledge of great truths we cannot deductively infer the existence of small ones. Fundamental knowledge is largely undervalued by most men. "To him who hath shall be given"; the more comprehensive the truths and the greater the number of them a man possesses, the larger is the amount of knowledge and wisdom he can evolve out of them. The clear understanding of the principles of one subject helps the mind to understand those of another, and, as those of one topic after another are mastered, the more easily is further knowledge acquired. The great fact that the universe and mankind are entirely governed by omnipotent molecular and molar energy, in accordance with a perfect system of laws extending from the mightiest masses to the very atoms of substances, constitutes the original fountain of knowledge, and is potentially capable of yielding all that we can reasonably expect to know. The more abstruse and complex the truth the larger usually is the amount and variety of knowledge required to enable us to perceive it; whilst it needs very little knowledge to apprehend our bodily wants, it requires a much larger amount to enable us to perceive the truth of universal causation that "whatever is, must be," and a still greater quantity to fully realise the equally comprehensive but more complicated statement that "whatever is, is good."

In the method of induction, we proceed by a process of inference from particulars to universals; we infer, from a greater or less number of instances of one kind, the existence of a general truth, principle, law, or statement, which includes them. In that of deduction, we infer that because such a truth, principle, or law, exists, certain unknown facts included in them must also be possible, or that certain unrecognised effects or consequences must occur under certain conditions. "All induction is but the inverse application of deduction: and it is by the inexplicable mental action of a gifted mind that a multitude of heterogeneous facts are caused to range themselves in luminous order as the results of some uniformly acting law" (S. Jevons, "Principles of Science," 1887); in this way the laws of mechanics and of gravitation explain all the movements of the heavenly bodies, and enable eclipses, transits, etc., to be reliably predicted. "Induction is the discernment, recognition, and verification of a general principle of Nature previously unknown." "Deduction is the evolution by logical processes, mathematical or otherwise, of the consequences, inferences, or implications, which a general principle includes or suggests" (J. P. Cooke, "The Credentials of Science," 1893, p. 15). True theory not only leads to true deductions and predictions, but also to imagination and new hypotheses and questions for investigation. Observation of facts without inductions from them is empiricism.

As advance in civilisation is a gradual process, it necessarily implies that our knowledge is incomplete; it is most so in the most complex sciences, physiology, psychology, and sociology, because their relations to the simpler ones upon which they depend are not yet sufficiently understood. According to the theory of evolution, the great mass of our knowledge has been evolved in "the chronological order of the sciences" (section 14), viz., from the simple to the complex. In agreement with this, it is well-known that until after Picard had made a sufficiently accurate measurement of an arc of the meridian in France, Newton, who had been waiting sixteen years for the necessary preliminary knowledge, was unable to verify his great discovery of the law of gravitation; and by means of this measurement it was found that the earth was larger and heavier than had previously been supposed. Similarly, many questions and phenomena in mental science cannot now be clearly answered or explained until the simpler sciences are more complete, and various persons have unsuccessfully attempted to explain social and moral phenomena without previously acquiring sufficient knowledge of the fundamental energies and principles of science upon which they depend. According to the late Cardinal Newman:—"The reign of knowledge is impossible" ("A Grammar of Assent," 1870, p. 89);—but knowledge already reigns, and increasingly so year by year.

The acquisition of knowledge is affected by a number of circumstances, only a few of which need be mentioned. Previous to the inventions of printing, steam-engines, railways, steamships, telegraphs, and telephones,

nations were kept largely in ignorance of each other by oceans and mountains. Life is more imperative than advanced information, the stomach is more clamorous than the brain, men must have the means of living before they can do much in the way of acquiring knowledge or discovering new truths. A very cold climate, by weakening the physical powers and decreasing the facilities of communication, diminishes the sources of information; a very hot one by inducing indolence, disinclines men to undertake the labour necessary to obtain knowledge. In consequence either of climate or of secular ignorance, there is not much new knowledge discovered in Siberia, Greenland, Arabia, Central Africa, Spain, Portugal, Mexico, or the south-west part of Ireland. An unfruitful soil, by absorbing the whole of men's energies in obtaining a living, leaves none to be expended upon intellectual acquisitions; poverty acts in a similar way, and we know that the poorest persons are usually the most ignorant;—"the poor as a lot are bad" (Tennyson); on the other hand, wealth is not always the most favourable condition for the acquisition of knowledge, because it frequently induces its possessor to occupy his time in frivolous pursuits and animal pleasures. Whether rich or poor, a learner must become clever in small things before he can be skilful in large ones; he must be able to read and write before he can profoundly think. By the progress of civilisation the means of obtaining knowledge have been enormously increased; and by the establishment of free libraries, and the cheapness of books and newspapers, there is now, less than ever, any excuse even for poor persons remaining ignorant. The present epoch of human development is largely devoted to adequately peopling the earth, but even this is as yet very far from having been accomplished, and until it is, knowledge can only be very incompletely developed. Knowledge is largely proportionate to density of population, and before nations can become very intelligent they must exist in the form of large communities; there is not much opportunity for acquiring knowledge in out-of-the-way settlements where the whole time of each person is otherwise employed, and where the nearest library, post-office, bookseller, etc., is many miles distant.

The condition of marriage, and its attendant circumstances, has very considerable influence upon the discovery and diffusion of knowledge. In accordance with the chief laws of science, the great forces of Nature operate so as first to secure simple existence of all living things;—second, the continuance of their species;—and third, to cause men to gradually become more intelligent. Those energies determine that the continuance of the human species shall be first secured and the world become adequately peopled, and that the increase, diffusion, and application of knowledge must follow the increase of population. In consequence of those forces acting upon human beings in this manner, men are compelled to satisfy their animal instincts, and the desire for money in preference to that for mental improvement; and men often pursue money for those purposes to the entire neglect of knowledge and self-evolution, and ulti-

mately become mere money-making machines. In this way it happens that whilst marriage secures the increase of population, it does not usually conduce much to the direct discovery of knowledge or to its application to mental improvement. The feminine mind also is less disposed than the masculine one towards the discovery of new truth. Youth is the time to get knowledge, and manhood is the time to get money.

The human brain requires frequent feeding to keep it in a healthy state; without varied reading or new experience the mind remains comparatively ignorant. Some persons who are very choice about what kind of food they put into their stomachs put very inferior mental aliment into their brains. The brain of man cannot live and be healthy upon novels nor upon false beliefs, any more than his body can be supported by tarts. A man must carefully consider the quality, quantity, suitability, and variety of the knowledge acquired; he must be careful to read good books, and to associate with intelligent persons; to prefer books which contain fundamental information to those filled with inferior knowledge; to prefer truth to error, facts to fiction, demonstration to dogma, science to sectarianism and supernatural beliefs. "A good book is the best of friends, the same to-day and for ever" (M. Tupper). Ideas of the great powers and laws which govern the universe are better companions than the best of men. Books are the legacies which genius leaves to mankind. "A small drop of ink produces that which makes thousands, perhaps millions, think" (Byron). "The ink of science is far more precious than the blood of the martyrs" (Arabian proverb). According to some teachers we should read "everything of something, and something of everything," *i.e.*, everything about our own speciality, and something of everything which is fundamentally important. Even genius requires to be largely aided by the experience and knowledge of others. "Genius is well-directed industry," but "the greatest genius will never be worth much if he pretends to draw exclusively from his own resources" (Göethe). The fever of genius creates a thirst for knowledge. Before a man can learn he must possess a certain amount of receptive power; a speaker or writer cannot impart knowledge to a hearer who has not acquired sufficient ability to receive it; previous knowledge of words and their meanings, as well as a habit of attention, are necessary before a man can successfully listen or read. Just as a building is strengthened by being buttressed, so knowledge strengthens knowledge; an idea which is connected with a variety of other ideas naturally related to it is much more readily remembered than when existing alone; and, similarly, knowledge of one subject is better understood and greatly strengthened by knowledge of cognate ones, because everything is related in Nature to everything, and especially to cognate things. "The best man is he who most tries to perfect himself, and the happiest man is he who most feels that he is perfecting himself" (Socrates).

If we do not possess knowledge it is a great advantage to know where to find it. Knowledge does not drop from the sky, fortunately it can only

be obtained by means of a certain amount of personal labour and self-discipline, the very act of acquiring it, therefore, necessitates self-improvement; unlike money, it can neither be wholly inherited nor entirely bequeathed. And what is true of ordinary knowledge, or that already existing, is in this sense far more true of that requiring to be discovered by means of scientific research; it can only be obtained by very much greater labour, cost, and self-denial, and is to a corresponding extent more self-improving. Origination is much more difficult than repetition; the attainment of eminence in learning, like that of "success" in life, is nearly always very costly. "Experience is the best schoolmaster, but the school fees are very heavy" (T. Carlyle). Abernethy said: "We have need of enthusiasm, or some strong incentive, to induce us to spend our nights in study, and our days in the disgusting and health-destroying observation of human diseases, which alone can enable us to understand, alleviate, or remove them. On no other terms can we be considered as real students of our profession—to confer that which sick kings would fondly purchase with their diadem—that which wealth cannot purchase, nor state nor rank bestow—to alleviate the most insupportable of human afflictions" (I. Disraeli, "Miscellanies of Literature," 1840, p. 426). The original thinker and investigator is both a slave and a friend to posterity, he does not ask the question "what has posterity done for me?" "Mighty and laborious works have been pursued, as a forlorn hope, at the certain destruction of the fortune of the individual. Vast labours attest the enthusiasm which accompanied their progress. Such men have sealed their works with their blood; they have silently borne the pangs of disease; they have barred themselves from the pursuits of fortune; they have torn themselves away from all they loved in life, patiently suffering these self-denials to escape from interruption and impediments to their studies" (*ibid.*, p. 429). Locke's essay on the human understanding was "the result of nineteen years' labour" (D. Nasmith, "Makers of Modern Thought," 1892, p. 195). "Milton could not desist from proceeding with one of his works, although warned by the physician of the certain loss of his sight" (I. Disraeli, "Miscellanies of Literature," 1840, p. 429). These are the men "who scorn delights, and live laborious days"; who

> "Laboured in their sphere, as those who live
> In the delight that work alone can give."
> —*Longfellow.*
>
> "No endeavour is in vain;
> Its reward is in the doing;
> And the rapture of pursuing
> Is the prize—the vanquished gain."
> —*Ibid.*
>
> "The heights by great men reached and kept
> Were not attained by sudden flight,
> But they, while their companions slept,
> Were toiling upward in the night."
> —*Ibid.*

" So are great deeds as natural to great men
As mean things are to small ones."
—*Ibid.*

" The fever to accomplish some great task
That will not let them sleep. They must go on
Until they die."
—*Ibid.*

" Our feelings and our thoughts
Tend ever on, and rest not in the present."
—*Ibid.*

" Lives of great men all remind us
We can make our lives sublime,
And, departing, leave behind us
Footprints on the sand of time ;

" Footprints that perhaps another,
Sailing o'er life's solemn main,
A forlorn and shipwrecked brother,
Seeing, shall take heart again.

" Let us, then, be up and doing,
With a heart for any fate ;
Still achieving, still pursuing,
Learn to labour and to wait."
—*Ibid.*

Who are "the mighty dead?" they are those who, during life, were in advance of the age and fought through cold neglect in order to bequeath new or important knowledge to mankind. The genius is not the man who "swims with the tide"; who lives for himself or family alone, or merely for the present time. The spirit of highest genius is not selfishness but altruism; genius and inspiration are consequences of natural influences, concomitants of incessant labour, experience, and of meditation, aided by the storing-up of good and great thoughts and all cognate ideas :

The genius " can behold
Things manifold
That have not yet been wholly told,
Have not been wholly sung or said."
—*Ibid.*

" Till glimpses more sublime
Of things unseen before,
Unto his wondering eyes reveal
The Universe, as an immeasurable wheel
Turning for evermore
In the rapid and rushing river of time."
—*Ibid.*

" Oh, Palissy ! within thy breast
Burned the hot fever of unrest ;

Thine was the prophet's vision, thine
The exultation, the divine
Insanity of noble minds,
That never falters nor abates,
But labours and endures and waits,
Till all that it foresees it finds,
And what it cannot find, creates."
—*Ibid.*

A man who wishes to become highly eminent in any particular occupation must devote his whole time and energy to it, otherwise he will be surpassed by those who do. This truth applies with the greatest force to those studies and occupations which are least encouraged and require the most ability, such as discovery, invention, philosophy, geographical enterprise; and in less degree in artistic occupations, music, the drama, painting, and in many instances to politics and oratory. Hence we usually find that the most eminent discoverers are not usually good financiers; superior orators are not eminent discoverers; clever actors are not able inventors. Great learning is not always accompanied by discretion. Those who are learned in great subjects are often deficient in small ones, it is quite enough tax upon feeble human powers to become highly learned in any one subject.

Modern popularity is by no means a presumption in favour of essential ability, but is often the reverse. Popular men rarely have the large amount of time at their disposal for the deep thought and meditation necessary to produce much originality. Popularity rules the day; the public do not usually read, and editors rarely publish, articles which go to the foundations of subjects. Numerous books have been published on various questions, requiring knowledge of the fundamental truths of science, but with very superficial and mistaken notions of science in them, and large numbers of them have been sold. "A precious work on a recondite subject, which may have consumed the life of its author, no bookseller can patronise, and whenever such a work is published, the author has rarely survived the long season of the public's neglect." . . . "The literary work which requires the greatest skill and difficulty, and the longest labour, is not commercially valued with that hasty, spurious novelty, for which the taste of the public is craving, from the strength of its disease rather than that of its appetite. Rousseau observed, that his musical opera, the work of five or six weeks, brought him as much money as he had received for his 'Emile,' which had cost him twenty years of meditation and three years of composition" (I. Disraeli, "Miscellanies of Literature," 1840, pp. 447, 448). Nearly all scientific investigators, except a few who are partly inventors, or who are in some form or other extensively advertised, suffer from neglect of their works. "In forty years the greatest work ever composed by man, Newton's 'Principia,' reached only a third edition" (Lord Brougham's "Dissertations on Paley's Natural Theology," 1832, vol. ii, p. 258). Most persons prefer smoothly

written but comparatively empty books, and even unsound ones, to those which are replete with valuable knowledge, because the latter require more intelligence and attention in order to understand them. Great men are often greater than their books, because many of their writings and sayings remain unprinted; in other respects they are often less because men cannot live up to their ideals. In many cases a popular man is a slave of common minds, one who dares not to be true to himself, but who, instead of raising others, lowers himself:

> "And like the scholar, whom the love of pelf,
> Tempts from his books, and from his nobler self."
>
> —*Longfellow.*

> "How wretched is the man with honours crowned,
> Who, having not the one thing needful found,
> Dies known to all, but to himself unknown."
>
> —*Ibid.*

Rules of trade often prevent or hinder the publication of advanced knowledge; tradesmen of course will not buy what they cannot sell, however good it is. Editors of newspapers and reviews will not publish contributions, however important and pertinent to a subject they may be, if they are not just in season or in the fashion, if they are distasteful to many of their subscribers, or if they require more preparatory knowledge to understand them than their readers possess. All this is in perfect accordance with the great principles of causation and evolution which regulate the rate of human progress, and which, whilst determining improvement and advance, prevent too rapid change. "Trade, commerce, and bargaining harden men"; it is well-known that in order to win money a man will cause his own horse to lose the race (R. A. Proctor, "Familiar Studies in Science," 1882, p. 251).

We all know the familiar sayings, "knowledge is power," "he who has knowledge can help himself and his fellows"; it diffuses blessings upon the rich and the poor alike. "Knowledge is indeed that which, next to virtue, truly and essentially raises one man above another" (Addison). Suitable knowledge fits a man for life and for death and destroys the fear of each. Knowledge is the chief sentinel of human life, which warns us of all kinds of approaching danger, bodily illness, insanity, etc. It is essentially more valuable than money, because it enables a man better to preserve his life and health; multitudes of wealthy persons, through deficiency of suitable information, are unable in old age to retain either their health, sanity, or happiness. It enables him to perceive that the purest happiness lies in doing the greatest good, which an ignorant man can neither perceive nor carry out, however wealthy he may be. "Nothing after health and virtue can give us so much satisfaction as learning and knowing" (Göethe). A man may know something of all subjects and be very popular, but if he has not learned the art of happiness, his knowledge

is not of so much use to himself. Worry attends upon wealth and upon fame, and less upon knowledge, but even the possession of learning does not entirely exclude anxiety. Newton, in a letter to Leibnitz, said: "A man must either resolve to put out nothing new, or to become a slave to defend it":

> "Happy the man who, studying Nature's laws,
> Through known effects can trace the secret cause,
> His mind possessing in a quiet state,
> Fearless of fortune, and resigned to Fate."
>
> —*Virgilius.*

> "Science for man unlocks her varied store,
> And gives enough to wake the wish for more.
> Enough of good to kindle strong desire;
> Enough of ill to damp the rising fire;
> Enough of joy and sorrow, fear and hope,
> To fan desire and give the passions scope;
> Enough of disappointment, sorrow, pain,
> To seal the wise man's sentence, 'all is vain,'
> And quench the wish to live those years again."
>
> —*Pope.*

Extension of knowledge tends to equalise men, not by depressing ability, but by increasing it; not by weakening the strong, but by strengthening the weak. The invention of printing has made knowledge and its power accessible to all; that of gunpowder has largely increased the military power of infantry in relation to that of cavalry; the adoption of railways has enabled the poor man to travel as quickly and comfortably as the rich one; the invention of the steam-engine has increased the power of the feeble workman relatively to that of the strong one; the use of steamships, railways, and freezing machines has made food as cheap to the mechanic as to all grades of men above him; and similarly in many other cases.

> "Put forth your force, my iron horse, with limbs that never tire!
> The best of oil shall feed your joints, and the best of coal your fire;
> Like a train of ghosts the telegraph posts go wildly trooping by,
> While one by one the milestones run, and off behind us fly."
>
> —*Professor Rankine.*

> "Speak the word, and think the thought,
> Quick 'tis as with lightning caught—
> Over, under, lands, or seas,
> To the far antipodes."
>
> —*Kipling.*

"The end of all our study is not knowledge but conduct" (Aristotle); we should seek knowledge because it is good and leads to good. The highest object of life is not learning, but goodness; the possession of

knowledge, like that of any other good thing, is only a means to an end, "to be used but not abused," to enable men to "be good and do good"; to successfully guide man in his career through life, to enable him to predict with certainty the future consequences of his acts and of those of all things around him, and thus to secure the greatest safety, happiness, and peace for all. It has been said that: "Even at its best knowledge is immeasurably less precious than Goodness and Love" (F. P. Cobbe, "The Scientific Spirit of the Age," 1888, p. 6); but we must not forget that knowledge is essential to the highest goodness; and that it is not of much use to extol "love" unless it is guided by knowledge and wisdom. As knowledge is the basis of all inference, it is illogical to say: "For the reasoning powers, the noblest in the scale of human faculties, it may fairly be doubted whether the modern increase of knowledge has done much to strengthen them" (*ibid.*, p. 159); that it really has enlarged the reasoning powers is fully proved by the fact that every successive year man's knowledge and reasoning power increases. The existence of the planet Neptune was predicted before it was seen; Bessel foretold the existence of a companion globe to Sirius, and it was afterwards observed by Clarke in the year 1862; also one of Procyon, and astronomers fully believe in the existence of the latter, although it has not yet been seen; and men can now predict the consequences of their own actions more than ever they could. The sacredness of property and of life has also increased with the extension of knowledge. The statement that: "Knowledge engenders moral faults" (*ibid.*, p. 169), is a very partial one, because it ignores the far greater good effects which it produces. It is quite true that knowledge, like every other good thing, is sometimes used for bad purposes, but in such cases it is not the possession of the scientific knowledge, but the absence of moral instruction and training which "engenders moral faults"; it is the morally ignorant amongst mankind who most frequently use information badly. Many of those who doubt the moral value of scientific knowledge have not sufficient of it, or of discernment, to perceive that such knowledge is really the essential basis of morality and of goodness. Everything we have known and experienced has helped to make us what we are; the whole of human history proves that mankind are both developed and saved, body and mind, by the use of knowledge discovered through action and reaction between men and their environments. Notwithstanding all the superficial and merely apparent evidence to the contrary, "the moral nature is influenced beneficially by the pursuit of science" (Maudsley, "Responsibility in Disease," 1874, p. 304). Knowledge of verifiable science imparts certainty, and that of mathematics conduces to accuracy, and each leads to truthfulness, which is a fundamental virtue; the true "Rock of Ages" is scientific certainty, not blind belief.

We know that knowledge is necessary to the happiness and success in life of everyone; that its amount is practically infinite, that a single human brain can only contain an extremely small proportion, and that every

department of life has its own group of laws and rules to be learned. It is evident, therefore, that each person should, whilst young, make a wise selection, and endeavour to acquire not only that special kind which by yielding an income will enable him to live, but also a clear understanding of the great forces and laws of Nature which govern mankind, and are the foundation of wisdom and happiness; his aim in life should be not too high for the period nor for his own ability to accomplish. Specialists often succeed in life the best; a man with two occupations cannot be eminent in either, and is usually paid at an inferior rate in each. Some persons, hoping to secure an extra share of happiness, select an "all-round" course of training and instruction, but it is evident that as a single human brain can only contain an infinitely small proportion of existing knowledge, an "all-round" mind must be a very small one, unless it includes a varied selection of fundamental principles. To know one's defects is the first step towards improvement; many a youth has been made conceited by being injudiciously praised:—

> "Study yourselves, and most of all note well
> Wherein kind Nature meant you to excel."
>
> —*Longfellow.*

When selecting coins we usually pick out the most valuable, but when selecting knowledge we often choose those ideas which are pleasant and interesting, and reject those which are the most important. Great ideas make great minds, and small ideas are usually associated with little ones; and if a man's mind is much occupied with small thoughts, it cannot be so full of large ones. Narrow principles and rules are often preferred to wide ones, because they appear to be the most practical, but although they may be more suitable for quickly obtaining small advantages, they are less fruitful in doing good or securing permanent happiness. It has been said,—"Be not wise overmuch. Why shouldst thou die before thy time?"; but we can hardly possess too much wisdom, because it is the chief preservative of life, and the foundation of goodness. A large stock of inferior knowledge may be nearly as great a defect as ignorance; and vicious knowledge or false belief, unless it is properly controlled, is worse than ignorance. There are multitudes of books which do not convey to one's mind a single important idea. Those who know many trifling facts, commonly know but little about great truths, and those who know most of ancient subjects, usually know least about modern ones. As living men are more valuable than dead ones, so are living languages of more service than ancient ones:—

> "Consult the dead upon things that were,
> But the living only on things that are."
>
> —*Longfellow.*

Those who talk much, usually say but little of value. "He that hath

knowledge spareth his words" (Proverbs, chap. xvii). "Even a fool, when he holdeth his peace, is counted wise" (*ibid.*). "Great talkers are often small thinkers" :—

> "They never taste who always drink ;
> They always talk who never think."
>
> —*M. Prior.*

In the case of profound and complex questions, reading and meditation are much more productive of valuable knowledge than discussion, because such questions require concentrated attention and the entire absence of excitement in order to understand them. The obscure meditative philosopher is as necessary to human progress as the popular expositor. Meditation adds greatly to the certainty of our knowledge ; a man who possesses only a moderate amount of fundamental knowledge, and reflects quietly upon it, usually arrives at wiser conclusions than he who possesses a large amount of ordinary information. Lord Bacon said,—"Reading makes a full man ; writing, an accurate man ; and speaking, a ready man" ; but he omitted to say that reflection makes a wise man. "To be accurate, write ; to know thy own mind, write" (M. Tupper).

"Argument often leads to coolness and misunderstanding" (Lubbock, "Uses of Life," 1898, p. 97). Men quarrel about abstruse questions which no man can settle, but not as to whether two and two make four :— discussion about such questions more often produces enmity than conviction or knowledge, and very few eminent philosophers employ it in such cases ; it induces men to seek victory rather than truth ; it is a favourite method with some persons, because it affords excitement, because it is a contest of ability in which superficial minds have often an unfair advantage over comprehensive ones, and because untrue superficial explanations are more easily understood than true ones ; men's minds require to be considerably educated beforehand to be able to understand great truths ; it however often stimulates persons to study more deeply questions which they have only imperfectly studied before.

The minds of many men are to a certain extent diseased, through assimilation of unhealthy ideas. One symptom of this is the readiness of large sections of the community to accept unscientific beliefs, and be misled by comparatively incompetent instructors and leaders.—Other symptoms are the acceptance of anarchist and socialist doctrines of physical violence and spoliation.—The great neglect of moral instruction.—The readiness of ignorant electors to vote for incompetent Members of Parliament.—The frequent resort to personal violence as a means of settling disputes.—The existence of so much unreasonable dissatisfaction with unavoidable evils ; the fear of natural death, and the unreasonable anxiety respecting a future state.—The extensive neglect of self-discipline, and of forethought as means of protection against future mistakes and suffering ;— the great waste of time by young men and women in amusements and

inferior pursuits; and a multitude of other signs which need not be mentioned:—

> "Young men think old men fools, and old men know
> Young ones must be so."
> —*Dr. Metcalf.*

The great mass of mankind attempt to get through life as if it required no mental preparation; but a man can no more succeed in life without suitable knowledge than without proper physical food. Each man requires knowledge of himself, of his fellow-men, of external nature, and of his relations to them; if he remains ignorant of the constitution of his own body and brain and of their requirements, he is very liable to contract physical and mental disease; if he neglects to learn his duties and relations to his fellow-men he acquires a bad character and many enemies; if he knows too little about the properties and relations of bodies to himself, he renders himself liable to serious mishaps, accidents, and calamities; if he is ignorant of the great powers and laws of the universe he misses the great guides of life, and becomes the victim of superstitious terrors, selfish expectations and delusive beliefs, etc., etc. A suitable variety of fundamental knowledge, with ability to reason upon it, is the greatest preservative from insanity.

As the final object of human life is not learning, but goodness, the pursuit of knowledge requires to be regulated, there is avarice of learning as well as of money, but there cannot be a greed of goodness; some men are greedy of knowledge, and do very little good to their fellow-men with it when they have acquired it; others vainly place more confidence in money as a means of securing a happy life. Many persons, believing that money is the greatest source of happiness, select only that kind of knowledge which will help them to acquire it quickly, but they sooner or later find that the fullest happiness is not secured in that way, and in many cases they virtually walk straight into their graves, simply through bad habits engendered by wealth and deficiency of knowledge how to take care of their lives. Some men feather their nests until they become too warm. Many men are too busy in getting money to do their work well, and others try to hold the balance even, between greed of gold and greed of heaven:

> "Get place and wealth; if possible with grace;
> If not, by any means get wealth and place."
> —*Pope.*

"Give me neither poverty nor riches" (Agur). It is better to be a happy philosopher than a miserable millionaire. "He heapeth up riches, and knoweth not who shall gather them" (Psalms, chap. xxxix). Knowledge is a much more secure possession than wealth; "for riches certainly make to themselves wings" (Proverbs, chap. xxiii). Wealth does not necessarily

produce nobility of mind; money without labour will not buy either intelligence or a good character. "Knowledge is itself riches"; but knowledge is not complete in any subject, and practically in going through life we have to be satisfied with what we can get, and we are usually guided chiefly by instinct and partly by knowledge.

Knowledge has more fundamental properties than money; the employment of it and of barter preceded the invention of money; we employ it constantly from morning till night, but money only at intervals; we use it to guide all our actions except the automatic and instinctive ones, but we only use money as a medium of exchange; the most ignorant savages, who do not use money, possess some knowledge, and do not live entirely by instinct. In less than one per cent. of all our business transactions is actual coin employed. The relative values of money and knowledge depend upon circumstances, and differ in every different case, the first necessity of life is a means of living; but "to obtain an income" is frequently made an excuse for acquiring riches; a certain amount of money is indispensable; but a comparatively poor man with plenty of valuable knowledge is more happy than an ignorant one with plenty of riches. The pursuit of wealth and the discovery of new knowledge are largely incompatible; the former is more selfish, and the latter more altruistic. A man may be able to obtain by means of financial ability an income of more that ten thousand pounds a year, and yet not be able to perceive that all the conveniences and comforts of life which he and other men enjoy have had their origin in new knowledge. "A rich person, however worthy, can rarely feel sure that he is respected for himself. The more wealth he has, the more difficult it is for him to find out what people really think about him" (C. J. Hardy, "The Business of Life," 1891, p. 212). "A man may be rich in a cottage, and poor in a palace" (*ibid.*, p. 213). A great number of persons inherit, or otherwise acquire, large sums of money and property, without apparently having done much to deserve it; but they also inherit with it the responsibility of using it well; and great possessions, unless properly used, are a great punishment:

> "Is yellow dirt the passion of thy life;
> Look but on Gripus, or on Gripus' wife."
>
> —*Pope.*

> "To whom can riches give repute or trust,
> Content, or pleasure, but the good and just?
> Judges and senates have been bought for gold,
> Esteem and love were never to be sold."
>
> —*Ibid.*

> "With most men, do riches earn themselves a double curse;
> They are got by tight dealing; they are ill-spent by loose squandering."
>
> —*Tupper.*

> "There is a limit to enjoyment, though the sources of wealth be boundless;
> And the choicest pleasures of life lie within the range of moderation."
>
> —*Ibid.*

" That which is got over the Devil's back is spent under his belly."

" Whereunto is money good ?
Who has it not wants hardihood,
Who has it has much trouble and care,
Who once has had it has despair."
—*Longfellow.*

Even the possession of knowledge does not necessarily produce moral conduct or personal happiness unless the knowledge is of the proper kind. Some persons doubt the fact that knowledge is a blessing, because they often see it used for bad purposes, to promote the selfish desires of its possessor, to take undue advantage of or inflict injury upon other persons, instead of to increase general welfare; but the bad use of it is proof of ignorance of the two great moral rules, to do the greatest good, and to do unto others as we would have them do unto us, and it usually reacts upon its possessor in his old age so as to make him miserable. It is well to be a giant in knowledge, but not to use it like a giant to injure others.

Desire for knowledge, like a craving for food, requires to be regulated; some children are quite insatiable for it, and are continually asking questions. Many grown-up persons desire to possess knowledge which cannot exist or which is altogether beyond our present means, or too much in advance of the time, like a hunger for food "out of season." Some expect an answer to every question, and ask as if they had a claim to be told everything they want to know, no matter how costly or difficult to obtain the answer may be; R. A. Proctor relates, "I was asked at the close of a lecture on the star-depths why I had not told my audience the true shape of the sidereal universe; that is, its relative length, breadth, and depth. I replied in effect that before I could give this information I must first possess it myself, and that as yet no man possessed it. I could perceive that the audience was very far from satisfied with this reply" ("The Expanse of Heaven," 1874, p. 240). In mediæval times some have wished to know, "how many angels could dance upon the point of a needle?" others—

" Whether angels in moving from place to place
Pass through the intermediate space.
Whether God himself is the author of evil,
Or whether that is the work of the Devil,
When, where, and wherefore Lucifer fell,
And whether he now is chained in Hell."
—*Longfellow.*

Many beliefs held, and questions about them asked, now, by unscientific persons, are quite as irrational as the above, and in due course of time, apparently not very distant, will appear equally ridiculous to all intelligent persons. It is very easy for ignorant persons to temporarily nonplus the learned by asking them unexpectedly some senseless, complex, or profound

question in subjects which would require considerable study to answer, and then flatter themselves that they have achieved a victory. There are many questions which no amount of profound thought will enable us at present to answer, simply because we do not yet possess the necessary data. "A fool can ask more questions in an hour than seven wise men can answer in seven years" (Italian proverb). It is also more self-flattering and less self-sacrificing to assume the functions of a critic than to devote time, energy, and money to profound philosophical meditation or original experimental research. "A wise man cannot ask more questions than he will find fools ready to answer them."

Our liberty of thought and action is largely proportionate to our knowledge; he who possesses the largest amount of suitable knowledge has the greatest power and liberty, because he can so adapt his surroundings to himself as not to be thwarted in his actions or incur punishment through making mistakes. Men are now more free than ever they were; the freedom of the poor has increased very rapidly, and at a much more rapid rate than that of any other section of the community. It is chiefly in consequence of the discovery and diffusion of knowledge that we have obtained all the freedom of civilisation; improvements in sciences, arts, manufactures, social conditions, laws, customs, comforts, education, luxuries, etc., etc., which we now possess, a mere list of them would be a very long one. Better knowledge of the circumstances and conditions of human defect and disease lead to a more humane and successful treatment of it, and this is largely the justification of new surgical operations and experiments upon men and animals. When we consider the multitude of errors, accidents, and calamities, constantly occurring, due to deficiency of information by persons of good intentions, it is evident that it is an important moral duty of every person to acquire knowledge, and not to be satisfied with mere "good intentions." Nations who neglect scientific knowledge are liable to loss of territory by the irresistible force of the stream of civilisation; thus China has recently lost possessions, and so has Spain. "Our prayer should be, like that of Ajax, for more light."

> "Let our unceasing, earnest prayer
> Be for more light, for strength to bear
> Our portion of the weight of care,
> That crushes into dumb despair
> One half the human race."
>
> —*Longfellow.*

According to a variation of a well-known verse:—

> "'Tis" true knowledge "that can give
> Purest pleasures whilst we live,"
> "Tis" real knowledge "can supply
> Consolation when we die."

By true and real knowledge is here meant those broad philosophic views which enable us to see good in all things, which moderate and calm our

passions, and make us more tolerant towards our fellow-creatures, which preserve us from future injury by enabling us to perceive beforehand the future consequences of our acts, which without unduly chilling our natural instincts, feelings, and affections, regulates them, and enables us to gratify them with present safety and without future injury to any one. True ideas respecting human life and energy, man's position in the universe, the relations of mind to matter, "immortality of the soul," etc. Where there is no knowledge of natural energy, or faith in natural knowledge, there is inadequate realisation of, or confidence in, unmeasurable power or goodness. Nearly all the ordinary attempts to prevent war, drunkenness, crime, and other "evils," have been failures except so far as they have induced men to obey the great powers of Nature by acquiring knowledge respecting them; thus punishment, teetotalism, religion, and argument, have only been palliatives, except so far as they have operated through knowledge and the personal conviction produced by it.

Knowledge of the great energies and laws of science will be of vast importance to mankind in the future, not only by answering immediate questions, but by an enormous extension of the power of predicting future consequences and events in all subjects. "To what then may we not look forward, when a spirit of scientific inquiry shall have spread through those vast regions in which the progress of civilisation, its sure precursor, is actually commenced and in active progress?" (Herschel). "Knowledge, like virtue, is not good because it is useful, but useful because it is good" (F. P. Cobbe, "The Scientific Spirit of the Age," 1888, p. 170).

"Prevention is better than cure." Whilst statesmen, ministers of religion, and philanthropists have been palliating great evils, science has gone to the root of the matter. By extending its boundaries and increasing the facilities of communication between nations, it has largely diminished the probabilities of war; and by making war too destructive to be employed, it will probably put an end to it. By producing railways, telegraphs, steamships, etc., it has prevented the great famines which formerly killed millions of persons. By the development of ice-making machines, it has enabled us to quickly obtain all kinds of food from distant lands, and has preserved us from scarcity of nutriment; in cases of famine there has always been a superabundance of food somewhere, but it could not be quickly ordered or transported. By discovering the causes of disease and by inventing sanitation, it has prevented a vast amount of suffering. Directly or indirectly, in consequence of the extension of knowledge, "the span of life is now six years longer than it was half-a-century ago"; "wages have risen fifty per cent., while none of the necessaries of life, except meat and a few of the comforts of life, are ten per cent. dearer" (Mulhall, "Progress of the World," 1880, pp. 141, 142). According to historians, five hundred years ago, chimneys were considered a luxury in England, and so were shirts, and we had neither printed books, tea, coffee, potatoes, or tobacco. Previous to the year 1823, common salt was a luxury, and was taxed thirty times its value; and in the

year 1820 English mail-coaches ran only seven miles an hour (*ibid.*, pp. 152, 153). Saving of intellectual labour, and of the use of money, have also been great; "Sir J. Lubbock estimates that 97 per cent. of our financial transactions are done by means of bills or cheques, 2½ per cent. of bank-notes, and only ½ of one per cent. of coin" (*ibid.*, p. 538). Additional examples, sufficient to fill a volume, of the great physical and moral good of scientific knowledge, might be given if it were necessary. Similar (and even more important) effects than those which have already occurred with regard to our physical welfare, will yet occur with respect to our mental happiness and social well-being, when the great truth becomes sufficiently recognised, that science is not only the basis of physical knowledge and material happiness, but also of that of morality, sociology, and religion. There is an incomparably larger amount of peace and happiness to be obtained by the practical application of the rules of morality based upon science, than from all the diamonds and gold of Africa and Australia, or from any system of unprovable theological beliefs. Knowing, predicting, and preventing, is much better than sinning and repenting. "The perfection of knowledge is the perfection of morality" (Barratt, "Physical Ethics," 1869, p. 115). Pure knowledge is the solace of old age (I. Disraeli, "Miscellanies of Literature," 1840, p. 467). The most effectual way to prevent pauperism and crime is by extending secular information and moral instruction. Knowledge of art without that of science and morality does not prevent national decay; thus, the ancients built great cities, enormous pyramids, magnificent temples, gorgeous palaces, wonderful obelisks, and remarkable aqueducts, but they were deficient in fundamental knowledge of science and of sociology, and their great works, although requiring mechanical knowledge, and great command of labour, did not prevent national degeneration and final extinction; luxury in works of art is considered to be a precursor of national decay, because it indicates a superfluity of wealth which might be more beneficially employed.

We know that all things are related to all things, that the actions of all men are related to those of all men, and science is rapidly increasing those relations by extending the facilities of communication. It is gradually becoming known that the welfare and ill-fare of each man is dependent upon that of all other men, and, *vice versâ*, and that every person shares to a certain extent in the prosperity and suffering of others. Extension of knowledge is gradually diminishing selfishness by showing each man that he cannot, dare not, live for himself alone, that he can only secure the greatest happiness by doing good. "If we know what is good, we shall incline to do it." Knowledge of the great powers and laws which govern mankind, tends not only by the motive of love, but also by that of fear to prevent lawlessness and crime. The more men understand that natural punishments are certain and are enforced by irresistible energy, the more they acquire a habit of obeying them, and the more moral they become. These two motives are gradually taking the place of those of expectation of

eternal bliss and of eternal torture after death, and possess this advantage that whilst the former are based upon verifiable evidence, the latter depend upon blind beliefs which cannot be proved. "It is safer to be feared than loved" (Machiavelli); first, because nearly all men will take whatever they dare; and second, because intellect is stronger than affection for purposes of self-defence; physical weakness encourages robbery and murder, wherever there is anything to be gained by it, and hence, nations do not defend themselves from spoliation by means of love but by cannon balls. Kindness and threats without the power to punish encourages conceit and over-reaching.

Every different object of life requires us to possess a different kind of knowledge in order to attain it. If men wish to become moral they must study the rules of morality, and the great energies and laws of science which enforce them; it is not sufficient to possess a general knowledge of science such as is usually taught in schools. All knowledge of science, however, enables men to see more clearly the consequences of their acts and the relations of those acts to omnipotent powers. Scientific knowledge has already relieved the most pressing of man's physical and social wants, by supplying him with the first necessaries of life; and it will in a more direct manner diminish immorality by showing the inseparable dependence of the rules of morality upon irresistible powers and laws. Through neglect of direct knowledge of moral rules the science learned in schools and colleges has hitherto been in some measure applied to inferior purposes; very many young men have gone to college, not so much for the purpose of learning truth or how to become most useful, but to obtain "tips" to enable them to get money quickly, or to acquire aristocratic acquaintances. A college is at present not so much a fountain as a mart for knowledge; *i.e.*, it is less a place for original research than for instruction; but this is a necessary preliminary to something better.

Most persons know that real knowledge expands the mind, that philosophic studies pacify the feelings. It is further true that scientific knowledge enables us "to feel with other senses, to imagine vaster thoughts," and that the knowledge of universal causation, that all men do as they must, diminishes the animosity of men, whilst it increases their responsibility and the necessity for correcting wrong. Of all pleasures, that of acquiring knowledge least satiates; an intelligent person rarely becomes tired of learning or knowing. But no good thing is originally obtained without labour; knowledge of great scientific truths, and a firm belief and faith in their power, are not to be acquired without considerable reading and meditation. To discover and diffuse new knowledge for the benefit of mankind is truly to "feed the hungry" on a large scale, because the knowledge obtained is free to all men; but original ideas are comparatively scarce, ordinary publications of nearly all kinds, except scientific, are largely filled with empty "re-echoes" of trivial things. The time is getting ripe for the advent of knowledge as the ruling power; the age has even now commenced when the nation which treats new knowledge as being

essentially more important than money or unprovable dogma, will become the leader in civilisation.

There was "a time when multiplication and division, squaring and cubing, the rule of three, the construction and equivalence of figures, with all their manifold applications to industry, commerce, fine art, and tactics, were just as strange and wonderful as electrical phenomena are to us" (Benn, "Greek Philosophers," i, 12). Mankind did not always know the exact length of the year, how to divide time or space, nor how to read or write; and even now there are millions of men who are unable to count one hundred. It is said that the earliest men knew no use of fire, and lived on fruits and water.

The relation of knowledge to wisdom is extremely important. Knowledge is the indispensable foundation of reason and judgment; and without the necessary ideas, wise conclusions cannot be formed. A man is often unable in difficult cases to determine what is right without the aid of knowledge; and an ignorant man cannot act wisely except by instinct or accident. Knowledge may exist without wisdom, but wisdom cannot exist without knowledge; a mere boy with a capacious memory may possess much information, and the minds of many men and women are filled with entertaining knowledge of very little value. It is well-known that extensive knowledge, an university education, and even great religious devotion, may and often do coexist with untruthfulness, dishonesty, recklessness, fraud, etc., but wisdom and immorality cannot coexist in the same person; a man who does wrong is a fool because he injures himself. What is called "worldly wisdom" is oftentimes not wisdom at all, but artfulness, and a sign of ignorance of moral rules and principles.

Knowledge is indispensable to scientific invention. There is a saying "necessity is the mother of invention," if, however, we consider the matter, we find that knowledge is the real mother of it, and that necessity is only the stimulant to action, for however great the necessity may be, we cannot make inventions unless we possess the requisite information. It was by means of knowledge of the scientific facts and principles discovered by investigators, that inventors were enabled to produce the steam-engine, telegraph, telephone, and all the other numerous practical contrivances which have so largely ameliorated the physical and social conditions of mankind. An attempt to form an invention without the necessary information is like trying to make an article without the necessary materials. "Who could have supposed that the properties of the conic sections discovered by the ancient Greek geometers would have been of infinite service in modern times in renovating and perfecting the art of navigation?" (C. Tomlinson, F.R.S., "Essays, Old and New," 1887, p. 129). "The sailor who has been preserved from shipwreck by an accurate observation of the longitude owes his life to a theory conceived two thousand years ago by men of genius who had in their view only simple geometric speculations" (Condorcet).

Human progress is at an accelerated speed. Knowledge increases

rapidly, not merely at the rate of simple addition, but in a much higher ratio, by combination and permutation. Whilst scientific men are busy, discovering new truth and applying it to human uses by means of invention, congresses and associations, lecturers, professors, editors, and writers, are actively diffusing our present stock of information. Scientific literature has become enormous, separate publications for every division and subdivision of knowledge, theoretical and practical, are now issued; information has increased until "the pen is stronger than the sword"; and no one can fully describe all the ways in which real intelligence operates for the good of mankind. In ancient times information was extensively lost through inability to preserve it, but, since the inventions of writing, printing, engraving, photography, the phonograph, cinematograph, and methods of reproducing facsimiles of pictures, voices, moving scenery, etc., knowledge has been rendered more secure and preserved from decay. By means of photographs, etc., science has lessened the need for travel:—

> "From them I learn whatever lies
> Beneath each changing zone,
> And see, when looking with their eyes,
> Better than with mine own."
>
> —*Longfellow.*

Although scientific intelligence has incomparable advantages over ignorance, it has some disadvantages to its possessor if it is much in advance of the time. It is often a great risk to expound new or advanced ideas; "no sooner does any philosopher attempt to substitute clear conceptions of the processes of Nature, for vague speculations incapable of verification, than the framers of such speculations and the acceptors of them with one voice exclaim, 'This is degrading human nature!' as if to leave men in ignorance was to sustain them in their dignity" (Lewes, "Problems of Life and Mind," 1874, vol. i, p. 159). Advanced learning separates a man largely from his fellow-men because they cannot understand him; what men cannot understand they do not appreciate, and what they do not appreciate they usually detract, discourage, and oppose. No matter how large may be its essential importance, or how greatly it may, in due course of time, conduce to the welfare and happiness of men, if it cannot be immediately and directly used for some personal advantage, which they with their limited scientific information can understand, they denounce it as "unpractical"; the greatest enemy of knowledge, however, is adhesion to dogmatic authority. That these statements are true is proved by the whole history of science; the mere possession of advanced scientific knowledge has always and does still expose a man to suspicion by the believers of unprovable dogmas, and it still excites the opposition of those who are manifestly ignorant of the great scientific powers which govern the universe and mankind, and who are apparently unaware that the most rational object to be worshipped is verified truth. Advanced thinkers and philosophers are often fancied to be "cranks" by ordinary persons, because their

ideas are beyond ordinary comprehension, and because they devote their lives to the good of mankind, but as it is unreasonable to believe unprovable assertions to be truths, philosophers know that it is those who believe such assertions who are really irrational :—

> "Truth would you teach, or save a sinking land?
> All fear, none aid you, and few understand."
>
> —*Pope.*

Disparagement of scientific knowledge is a favourite occupation with many "anti-vivisectionists." "That the opposition of such persons is not only directed against physiology, but also against science and scientific men in general, is shown by the very frequent and unnecessary use of the words, science, scientists, scientific discovery, men of science, etc., in the hostile language employed by them, and also by the following quotations: 'The dilettantism in pursuit of physical science'; 'the dilettante and empirical school of professors and physiologists'; 'scientists are finding out that they are not to have their own way without opposition'; 'the man of science never seems more ridiculous than when wearing the mask of philanthropy, with his keen, remorseless eyes peering out of it'; 'the man of science without religion and without heart'; 'the ossification of the heart as a result of the dilettantism of discovery'; 'the physical sciences will perhaps have to be called scientiæ inhumaniores'; 'accuracy is the last thing we now look for in the statement of a man of science'; 'accurate enough for scientific purposes'; 'the convenient darkness which always has been, and always will be, longed for by every man, be he scientist or be he assassin, whose desires and whose deeds are evil.'

"The important discovery, in cases of consumption, 'of the constant presence in the tubercles of exceedingly minute organisms,' termed bacilli, is thus depreciated by them:—'Analogy would seem to point out that as the knowledge that our cheese is eaten by "specific organisms," called rats and mice, and mites, has not been of any great advantage to us, so neither will such knowledge avail more with regard to the infinitely smaller creatures which we are told are the cause of disease.' They also speak of scientific knowledge in the following terms:—'The greed of knowledge'; 'thirst for knowledge at its best and purest is but an inferior part of our being, a part which we may share with demons in the pit'; 'the vilest devil may possess a million times more knowledge than is shared by the British Association'; 'you may buy knowledge at the cost of sin, and often do so in scientific investigations,' etc., etc.

"It is also worthy of notice that all this opposition comes, with but little exception, from unscientific persons, church dignitaries, noblemen, aristocratic ladies, officials of 'anti-vivisection' societies, and persons professing religion. The question therefore arises, why do unscientific, non-medical, and 'religious' persons so greatly oppose the infliction of pain on animals when it is done for the purpose of discovering new truth, and so little oppose it when it is done for vastly less justifiable purposes? There

must be a cause for this very significant fact, and the cause must be something connected with the discovery of truth.

"As the opposition comes so largely from the same class of persons who in all ages have opposed scientific research—viz., sentimental persons and others professing religion; and as it is chiefly confined to the cases in which the object sought is new truth, it is reasonable to infer that it is largely directed against the discovery of new knowledge, and the question of infliction of pain is far from being the only consideration.

"Why have such persons in all ages opposed the discovery of new knowledge? The cause lies in that circumstance which has always been present, viz., the dread that the power which new knowledge imparts may be used to overthrow their ignorant beliefs and sentiments, and thus diminish their happiness. Science has already changed human belief and conduct, and may do so again. This is a perfectly natural fear; it must be a painful experience to have to change one's long cherished sentiments, and those who have to do so deserve sympathy; but the irresistible powers of Nature are not influenced by this circumstance; civilisation marches on, and those who are ignorant of science are left behind. If we wish to avoid these painful experiences, we must avoid unstable doctrines, and place our faith in a knowledge of the great scientific energies and principles which regulate the universe and man. Perceiving the necessity of a retarding as well as of an advancing section of mankind, and having great faith in the inevitable development and progress of knowledge, I venture to say to all anti-experimentalists, although you have the laws of the universe opposed to you, you have a large portion of mankind with you, and you are performing the important function of retarding the speed of progress" ("Utility and Morality of Vivisection," 1884; Kolckmann, London). The anti-vivisection crusade is largely an instance of altruism and emotional sympathy, unregulated by scientific knowledge and reason.

It is a greater "evil" to inflict unnecessary pain upon a human being than upon a beast, because the nervous system of a human being is more sensitive. "Is not a man better than a sheep?" "Ye are of more value than many sparrows." According to the Pope, "men have no duties towards animals." One anti-vivisectionist, speaking of science, says "she has given us many precious things; but she has taken away things more precious still." "Another threatening evil from the side of science is the growth of a hard and pitiless temper. From whatsoever cause it may arise it seems certain that, with some noteworthy exceptions, the scientific spirit is callous" (F. P. Cobbe, "The Scientific Spirit of the Age," 1888, pp. 34, 25); and speaking of the "scientific spirit" says "if it only foster our lower mental faculties while it paralyses and atrophies the higher; if reverence and sympathy and modesty dwindle in its shadow; if art and poetry shrink at its touch; if morality be undermined and perverted by it; and if religion perish at its approach as a flower vanishes before the frost" (*ibid.*, p. 34). In reference to these rhetorical

detractions of science it may be remarked that the inexorable powers of Nature always appear "callous" to sentimentalists who do not understand their comprehensive goodness, and that science, instead of fostering the lower mental faculties and paralysing the higher, is well-known to do just the reverse, because it holds truth and reason to be the greatest of all blessings, and instead of merely palliating human misery in an unintelligent way, it prevents and relieves it on a comprehensive scale; those are the most humane who most benefit mankind. Another writer states—"to the Christian, modern science is a darkness compared with which the science that St. Paul rejected might almost be called Christianity" (Seeley, "Natural Religion," 1882, p. 3); nearly all intelligent persons, however, consider modern science to be modern enlightenment; it is only dark to those who cannot understand it. All those persons who disparage science share its advantages. An English physician has stated that "Dr. Jenner" (by giving us the knowledge of his discovery of vaccination) "has saved, is now saving, and will continue to save, more lives in one generation than were destroyed in all the wars of Napoleon." "In Vienna where the average yearly mortality from small-pox had been over 800, it was steadily and rapidly reduced, until in 1803 it had fallen to less than 30" (A. D. White, "History of Warfare between Science and Theology," 1896, vol. ii, p. 59). Scientific knowledge is a great civiliser; "missionaries have done good, in so far as they have taught the blacks to respect their marriage vows and occupy themselves with productive trades. But all they have accomplished, from the days of Livingstone down to this year of Jubilee, is small indeed compared with the evangelising effect of one locomotive" (Pountney Bigelow, "A Colonial Paradise," *Review of Reviews*, July, 1897, p. 50). It is not so much the conversion of savages by means of unprovable dogmatic beliefs, as by means of the great realities of science and rules of morality that is required. According to Sir S. Barker, "commerce is the best missionary." A multitude of additional facts might be adduced refuting the above detractions of scientific knowledge, if it were necessary. The man who is original in science encounters retarding influences and opposers of progress nearly everywhere; but whilst this hinders him, it also, by the law of action and reaction, excites conflict, and stimulates inquiry, and this usually ends by some progress being made. Whilst very few give all they can to original science, very many get all they can out of it. Eminence in science has been treated in much the same manner by the great mass of mankind as great ability in literature. Priestley was expelled from his home in Birmingham; and many years later a statue was raised to his memory; similarly with the ancient sage:—

> "Seven cities quarrelled over Homer dead,
> Through which the living Homer begged for bread."

Disbelievers in the great moral and intellectual value of fundamental knowledge are often those who do not wish to improve, who prefer lazy

beliefs, easily attained. Men who are able to perceive that an acorn grows to an oak, are often unable to realise the truth that abstruse scientific discoveries are the origin of human comforts. Such persons, instead of educating their minds to receive knowledge, expect science to be lowered to their mental level; but knowledge cannot be falsified to suit the small capacities of men, the faculties of men must be prepared to receive it; the universe was not constructed merely to represent men's little minds, but men's minds must be expanded to represent the universe; persons might as well expect an aboriginal savage to understand the English language, as expect themselves to perceive profound truths without suitable preparatory learning. Many appear to expect scientific men to tell them, in their own crude form of thought, all the possible forms of good to mankind of each and every experiment and new truth, or at least to prove to their satisfaction some direct and immediate benefit. But these expectations are childish; the world was not so much made for man, as man for the world, to do as well as he can in it; what such persons call "practical uses" are often secondary matters and selfish desires; seed does not grow to wheat in a minute, even when thousands of men are starving; and it is similar with food for the mind, we have to make sacrifices for knowledge in the form of labour, etc., and wait, in some cases centuries for the crop; it took hundreds of persons many years to learn how to make a good watch. Any person who wants new knowledge must be prepared to pay Nature's price for it; it is of no use to haggle about the high price of new knowledge nor about its not being "practical"; we must either accept the terms or continue to suffer the painful effects of our ignorance; we cannot buy new discoveries at so much a pound. Nature is usually ready to yield up her secrets to those who take the proper means, but not until the age is ready for them. In many cases the greatest immediate value of new scientific information lies, not in so-called "practical uses," but in the additional and useful light it throws upon other branches of knowledge, by enabling us to explain remote phenomena, show a connection between them, and enable the knowledge to be taught in schools, to be converted into inventions and be commercially applied; in other cases, the greatest effects are those which gradually grow out of it, either in the form of comprehensive truths or practical applications; thus, the greatest principles of universal order, universal causation, and of evolution, the telegraph, electro-metallurgy, etc., were evolved in this way; all knowledge is really practical, but some on so large a scale that unscientific persons cannot realise it. "On nothing did Huxley insist, perhaps, more strongly than on the conception that great as are the material benefits which accrue from science, greater still is the intellectual and moral good which it brings to man" (M. Foster, *Nature*, October 22, 1896, p. 604). The man who discovers comprehensive truths is usually considered "not practical," because he does not enable commercial men to at once "make money"; but much more good is done to mankind by discovering great truths than by applying little ones. The man who sows the seed is even more "practical"

than he who receives the money for the crop, because without his knowledge and labour there would be no crop to be sold; the sun would shine and the rain would fall in vain, and all the successive agricultural operations would be without effect. The narrow desire for direct and immediate personal advantage accords with the tradesman's idea of "quick returns" and with—

> "The market-place, the eager love of gain,
> Whose aim is vanity, and whose end is pain."
>
> —*Longfellow.*

If a man is too much behind the times in knowledge, his ideas and actions do more harm than good to his fellow-men, by unduly prolonging human suffering and postponing human improvement and happiness; and the same remark applies to sects and nations; anti-vivisectionists are thus postponing the day of relief of mankind from disease, and sectarians are conducing to the continuance of "religious atrocities." If, on the other hand, he is too much in advance of the age, he may temporarily do more harm than good, if by attempting too strongly to force the adoption of new ideas he puts greater strain upon his fellow-men to improve than they are able to bear. We may not too forcibly attempt to proselytise our fellow-men even for the purpose of indoctrinating them with verified truths, and certainly not with unprovable dogmatic beliefs. It is equally opposed to human welfare to suppress knowledge which is of importance to be known, on the ground that it is in advance of the age, because time is required for considering it and for preparing to put it in action; a man may therefore rightfully submit such knowledge for general consideration. Natural influences practically compel scientific men to unreservedly disclose all the discoveries they have made and the new thoughts they have evolved; and this agrees with the great moral rule incumbent on every one "to do the greatest good" he can to all men. No man may withhold from his fellow-men information which they are entitled to know, or which is of importance to be made known for the welfare of society; and this is recognised in courts of law by the oath taken by witnesses, "to tell the truth, the whole truth, and nothing but the truth." Within certain limitations, also, two or more persons may not agree together to conceal a crime, because the preservation of society is of far greater importance than that of a single individual; and the protection of a criminal from the just consequences of his acts is a crime against mankind. The methods hitherto employed to prevent the diffusion of real knowledge have been either to forbid inquiry, or to burn men as heretics; and that now usually employed is to substitute unprovable beliefs and unperformable promises for it.

Increase of new knowledge is of greater intrinsic importance than its diffusion, because if no new knowledge was discovered there would be none to be taught or to be converted into new manufactures, processes, or trades, by means of invention or commercial enterprise. Notwithstanding

this, nearly every unscientific person who wishes to promote science prefers to assist its diffusion rather than its discovery, and would rather give a large sum to aid the former than one-hundredth the amount to assist the latter, just as if, in a case of famine, food could be distributed without first obtaining it. The chief explanation of this is, that greater scientific information is required to perceive the value of the fruits of research than of those of teaching; nearly all men prefer to treat knowledge as a commodity, and to see quick returns for their investments;—but James Smithson, the founder of the Smithsonian Institution, Washington, was a remarkable exception to this. In his will he stated:—"Every man is a valuable member of society, who by his observations, researches, and experiments, procures knowledge for men." "It is in his knowledge that man has found his greatness and his happiness, the high superiority which he holds over the other animals who inherit the earth with him, and consequently no ignorance is probably without loss to him, no error without evil." "I bequeath the whole of my property to the United States of America to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men" (J. Smithson, *Nature*, January 16, 1896, p. 259). Such a man as Newton, Oersted, or Faraday, probably does more good to mankind than one hundred thousand athletes, footballers, cyclists, or propagators of unprovable beliefs, because he discovers important new knowledge for the use of all men throughout all subsequent time.

New scientific knowledge is usually very expensive to obtain, especially that which consists of great laws, such as that of gravitation discovered by Newton, or of great fundamental facts such as that of electro-magnetism discovered by Oersted, or of magneto-electricity discovered by Faraday, out of which have been evolved the dynamo-electric machine, electric lighting, electric smelting, and other great utilities. The first grain in weight of a new metal or gas usually costs its discoverer at least several hundred pounds; the cost of that of the metal thallium, and of the gases helium and argon, was very large; the price of the metal gallium even now, many years since its discovery, is about £600 an ounce. Many hundreds of thousands of pounds at least are yearly expended in time and money upon original research by scientific men, and the whole of the new knowledge thereby obtained is imparted without reserve to mankind. New knowledge of important truths is far more valuable than diamonds, and necessity justifies the great expense incurred in obtaining it. If it was not for the labours of real investigators there would be very little fundamental knowledge discovered. Our present civilisation is built upon the labours of men whose thoughts and works were in advance of their age; men who were neglected, and their works disparaged.

Original scientific research has been the primary source of nearly all modern manufactures and processes, and of an immense amount of employment for work-people; it was the origin of nearly all the great chemical and electrical industries, the manufactures of nickel, phosphorus, aluminium,

photography, electro-plating, electric lighting, the telegraph, telephone, ethereal messages, the extraction of gold from quartz, electric smelting, electrolytic refining, the recovery of gold and silver from copper, the manufacture of aniline dyes, of lucifer matches, artificial manures, and of a whole host of chemicals, etc., etc. Discoveries in microscopy and bacteriology, of inoculation, antiseptics, bleaching agents, deodorisers, medicines, etc., have led to methods of sanitation, of avoiding epidemics, of preventing the spread of contagious diseases, and of maintaining the public health, etc., and each member of the community thus participates in a great variety of ways in the benefits originated by scientific research. A list of a portion of the hundreds of thousands of original researches which have been made during the present century has been published in eleven large volumes by the Royal Society at a cost of more than ten thousand pounds, but probably less than one per cent. of our population know of their existence; and it is these researches which have originated nearly the whole of the world's scientific education and industrial progress, whilst other influences have subsequently assisted. Those published researches are continually being used by inventors. Without original discovery there would have been no knowledge with which to form inventions, and consequently no inventions, patents, or patent-agents; and as a very large sum of money accrues as profit to the Government of this country from the fees paid for patents, a fund for the recognition of discoveries recently made might with propriety be applied from it to help to defray the great cost of original scientific research.

Notwithstanding the vast benefits which scientific knowledge has in these and many other ways conferred upon mankind, wherever there is good work being done, there are always depreciators, cavillers, or idlers looking on. I venture, therefore, to insert a selection of quotations respecting some of the "evils" of science from a very pessimistic book entitled "Is Science Guilty?" (A. W. H. Forbes, 1897). "Some seek for national regeneration in a new social order, . . . they will seek it in vain while we are dominated by the petrifying hand of science" (preface, p. v). "Many far-sighted people are waking up to the fact that they are being gradually enslaved by an insidious despotism, which has bound them hand and foot, and deprived them of almost all pleasure of existence" (*ibid.*, p. vi). "We are fully persuaded that the pursuit of science is a 'will-o'-the-wisp' pursuit" (p. viii). "For the last hundred years science has been growing more and more in the ascendant, and what has been the result? I venture to say that it has been unmitigated misery and evil to mankind" (p. 4). "Surely we may say to science, 'Thou hast multiplied the nation and hast not increased the joy'" (p. 12). "The poor earn less money, enjoy fewer comforts, and drudge more pitiably than they ever did before" (p. 23). "The steam-boat, the railway, the electric telegraph, and machinery, while subserving many wonderful purposes, have rendered existence almost unbearable" (p. 27).

"The great Frankenstein of modern science having been called into

existence, is now master of the situation and cannot be shaken off" (p. 61). "It is impossible to extricate ourselves from the all-pervading tyranny of science, by which we are compelled to work ourselves or to make others work on Sunday" (pp. 63, 64). "Science has frozen mutton and beef, and carried it a distance of ten thousand miles, has scattered a meat diet all over the country, and has turned a nation of semi-vegetarians into 'riotous eaters of flesh'" (p. 67). "Science has called new wines, spirits, and liqueurs into existence, and crowded the British Isles with distilleries and breweries. The national expenditure in alcoholic drinks in the year 1893 was calculated at £138,854,829" (pp. 70, 71).

"Early rising is a lost art." Science "turns night into day, and day into night. It deprives man of half the use of his legs, his arms, his eyesight" (p. 67). "Where science is in the ascendant the unlimited diversity and perpetual alterations of costume are a source of continual heart-burning, criticism, back-biting, annoyance, pride, jealousy, and expense" (p. 71). "The whole system of artificial fashion and etiquette is the golden calf forged by modern science, before which modern society bows down, lacerates itself, and worships" (*ibid*). "It is the same with games and pastimes; everything is scientific and sophisticated." "Cricket has been elevated into a science" (p. 72). "Since science has laid her hand on sporting it has tended, bad as it was before, to become contemptible as well as brutal" (p. 73). "Thou shalt make to thyself idols of science, education, and fashion; thou shalt bow down to them and worship them" (*ibid.*, p. 74).

"Science is doing as much as she can to stamp the age of miracles out" (p. 87). "The vice of a scientific spirit is that it makes men depend upon their own arrangements alone, and regard them as the sole cause of their success. It makes them contract God out of His own universe, and fancy they have made themselves, and are making and supporting themselves and everything else" (p. 86). "Even the most devout Christians are largely imbued with this spirit, inoculated against their will with the virus of scientific materialdom" (pp. 86, 87). "Where science has not yet interfered, man can and does exercise as much faith and endurance as the lower animals" (p. 89). "Science beat scripture." . . . "Science was opposed to the Bible, and the Bible *must* give way" (p. 125). "The curse of science is that she sets on foot such godless competition, that she fires the mind of all men with a desire to be first and foremost, and that she incites men to engage in a killing race for riches and applause" (p. 91). "The further we get away from science and sophistication, the stronger do we find faith to be" (p. 92). "Surely God was shut out when those two oldest children of the laboratory were born—alcohol and gunpowder" (*ibid.*, p. 97). "Gunpowder is one of the great triumphs of science." "It is impossible to calculate the number of persons whose lives have been sacrificed to this great scientific invention" (p. 98). "Standing armies were unknown to our early forefathers. They are at most a modern necessity, and it is science which has made them so." "The weapons of

destruction which science has invented are so numerous and ghastly that I have not space even to name them" (p. 99).

"Missionaries have done a world of good, and they would have done a thousand times as much *if science had only left them alone.* But science will not. The same vessels that carry missionaries on deck carry opium in the hold. The same ships that carry the preacher of the gospel carry rum and whisky to the natives. The same canoes that carry the bread of life bring gunpowder and firearms also." "Small wonder that the poor heathen receives the gospel with dubious hands when it comes dogged and followed by such cursed evils" (p. 102). "Vivisection is the youngest, the most characteristic, and the pet daughter of science" (p. 104). "There is unfortunately plenty of this savage science carried on in England and Scotland" (p. 103). "What science may have in store for us who shall guess? One thing seems probable—she has left her measure for her own coffin. For the resources of science—dynamite, cordite, nitro-glycerine, gun-cotton, etc., are now the boast of the anarchist and the bomb-thrower" (p. 102). "It seems likely that the logical outcome of the great glory of our age, the great characteristic of our civilisation, scientific invention, will be the destruction of that civilisation, the ruin of that age" (p. 103). There is no advantage without some disadvantage, and those who receive the benefits of science must share its drawbacks, no man can have all he wants; it is useless to complain of the "evils" of life unless by so-doing we can help to remove them. Anyone acquainted with the history of civilisation will at once perceive the fallacies existing in some of the foregoing quotations; and many of the objections are in substance replied to in different parts of this book.

> "A man must serve his time to every trade
> Save censure—critics all are ready-made."
> —*Byron.*

Notwithstanding the fact of scientific discoverers giving all their new knowledge to the public, they are not unfrequently taunted with not giving more; some of the following quotations illustrate this fact:—1. "There is, it must be confessed, no science of human society properly so-called" (B. Kidd, "Social Evolution," 1894, 12th thousand, p. 1).—2. "The negative and helpless position of science" (p. 3).—3. "They look in vain to science and authority for any hint as to duty." "There is at the present time no science of human society." "Science has obviously herself no clear perception of the nature of the social evolution we are undergoing. She has made no serious attempt to explain the phenomena of our western civilisation" (p. 5).—4. "Science may be content to sit still and wait for the arrival of the avenging comet to put an end to prevailing misery" (p. 11).—5. "The general mind, so often more scientific than our current science, seems to feel that there is something wrong in the attitude of science towards this subject of religion" (p. 17).—6. "What place religious

beliefs are destined to fill in the future science has given us no indication" (p. 18).—7. "The time is certainly not far distant when she must look back with surprise, if not, indeed, with some degree of shame-facedness, to the attitude in which she has for long addressed herself to one of the highest problems of the history of life" (p. 19).—8. "What then are these religious systems which fill such a commanding place in man's life and history? What is their meaning and function in social development? To ask these questions is to find that a strange silence has fallen upon science. She has no answer" (p. 20).—9. "These religions of man form one of the most striking and persistent of the phenomena of life when encountered under its highest forms, namely, in human society. Yet, strange to say, science seems to have taken up, and to have maintained, down to the present time, the extraordinary position that her only concern with them is to declare (often, it must be confessed, with the heart and bitterness of a partisan), that they are without any foundation in reason" (p. 21).—10. "The more we regard the religious phenomena of mankind as a whole, the more the conviction grows upon us that here, as in other departments of social affairs, science has yet obtained no real grasp of the laws underlying the development which is proceeding in society" (p. 22).—11. "In whatever direction we look, the attitude presented by science towards the social phenomena of the day can hardly be regarded as satisfactory. She stands confronting the problems of our time without any clear faith of her own" (p. 24).—12. "The biologist" (Darwin?) "whose crowning work in the century has been the establishment of order and law in the lower branches of his subject has carried us up to human society and there left us without a guide" (p. 29).

One would suppose from all these questions, charges, and reiterations of implied neglect of the welfare of mankind by men of science, either that new scientific knowledge costs little or nothing to obtain, or that it is the duty of men of science to make expensive, difficult, and unremunerative investigations for public benefit at the instigation of unscientific persons; it is, however, a just and recognised rule, that those who work gratuitously have a right to choose their occupation. If unscientific persons so badly want all the above advantages and all those questions answered, why do they not themselves make the necessary researches for the purposes? or, if they have not ability to do that, why do they not learn the fundamental truths of science, as described in books, and think out some of the questions for themselves? Whilst it does not usually require much ability to find fault and ask complex questions, it often requires great self-sacrifice and expenditure to find remedies. Many good works, if left to be done by those who cavil at them, would never be done at all. Every writer may be reasonably expected to explain the real basis of his subject, and if it were desirable, the question might be asked, why in a work on "Social Evolution" which occupied "ten years" in preparation (see "Who's Who," 1899, p. 570), is the real basis of the subject omitted? All persons share the advantages of science, and some use discoverers "as

Eastern travellers do fountains; they drink their waters, and when their thirst is appeased, turn their backs on them" (I. Disraeli, "Miscellanies of Literature," 1840, p. 122). "The object of common men is not to do noble work by their own personal efforts, but so to plot and contrive that others may be industrious for their benefit" (Hamerton, "Human Intercourse," 1884, p. 22). "The mass are glad to have the results of science, as they are to buy Mr Rarey's horses after they have been tamed; but for want of courage or of wit, they rather leave the taming process to some one else" (C. Kingsley, "Health and Education," 1877, p. 262). The fact is, man is a beggar of Nature; valuable knowledge is not usually to be had merely for asking; and but little good can usually be obtained unless some one works for it. We must be content to work and wait for the millennium as we had for the advent of the steam-engine, telegraph, ocean steamships, photography, and all our present scientific advantages. "All things come round to him who will but wait," and work.

The attitude of science towards dogmatic religion, so much complained of and implicitly condemned in Nos. 5, 6, 8, 9, and 10 of the foregoing quotations, is perfectly explicable by the facts that contradictories cannot coexist, truth and error cannot agree. As civilisation is a slow process, the conflict between the two will be long continued; but what its chief result will be is clear to science now, and that is that all irrational beliefs will have to be abandoned; mankind will not tolerate for ever the "evil" effects of unprovable assertions.

With regard to the statements Nos. 1, 3, 4, and 11 in the above list, as they are fundamental ones in the subject of sociology, why do not those who study "social evolution" themselves explain them and supply the omissions?—as those under Nos. 6, 8, and 10 belong to religion, religionists may be expected to make them clear. And with respect to statement No. 5, that "the general mind" "seems to feel that there is something wrong in the attitude of science," we may remark that the infant mind seems to feel that there is something wrong because it cannot have the moon; the pauper's mind to feel similarly because it cannot have luxuries; and the socialist mind, ditto, that it is not allowed to possess everything; we must not be deceived by what "seems to be," but ascertain what really is. The figurative statement No. 4, "that science may be content to sit still and wait for the arrival of the avenging comet to put an end to prevailing misery," is abundantly discounted by the multitudes of scientific discoveries and inventions which have already largely diminished human misery; but to attempt to "put an end to misery," suddenly and entirely, would be productive of still greater misery. In reference to the statement No. 11, science has already a "clear faith of her own," otherwise she could not have made so many discoveries, and it is the incessant pursuit and worship of truth.

According to one theological writer, "A man is bound to know those things without a knowledge of which he cannot rightly do an act which he is bound to do. Hence all men are bound to know the articles

of faith and the precepts of universal law. Individuals are also bound to know those things which belong to their state and office" (W. Humphrey, S.J., "Conscience and Law," 1896, p. 17). In accordance with this fundamental practical rule, it is generally acknowledged that every man should be properly qualified for, and be able to perform the duties for which he is paid or which he undertakes, thus every medical man, lawyer, scientific expert, chemist, etc., is expected to be sufficiently acquainted with the fundamental truths and laws upon which his occupation is based, so as not to make serious mistakes in it. Similarly, teachers of morality, sociology, religion, and theology, and writers on those subjects, may be reasonably expected to be familiar with the great truths and principles of science upon which their subjects are founded. Medical men, and professional men of nearly all kinds, have applied the great truths of science to the explanation of their subjects, but theologians and writers on sociology seem to be almost entirely unaware of the great fact that morality, social evolution, and real religion are largely based upon the great principles of science.

Some detractors of knowledge who "hold the eel of science by the tail" (Pope) have made the disparaging remark that science does not know how to make a single living thing, not even the smallest particle of living protoplasm, as if they knew that science would never be able to do so. Others seem pleased when they have asked some complex question which science is not yet able to answer, such as what kind of weather it will be on some particular day six months hence; or when they are told that in many concrete questions, scientific men are nearly as ignorant as themselves. In a multitude of cases such detractors are precisely the same persons who readily believe attractive dogmas without any evidence at all or in distinct opposition to great scientific truths.

A common form of detraction of knowledge is by asserting that science can never make known to us the "essence of things," or "the nature of things in themselves" (J. J. Murphy, "The Scientific Bases of Faith" 1873, pp. 140-143), as if it was a disgrace that science could not at present explain everything, that human knowledge was not infinite, and that man's mental powers were not unlimited!! But is not all our knowledge of the properties and relations of substances more or less "knowledge of things in themselves"? we may reasonably affirm that to know that the particles of all bodies are in a state of incessant vibration, that the entire universe is filled with an unceasing vibrating medium, that an atom of copper is 63 times heavier than one of hydrogen, and other abstruse realities respecting substances, is to know something of the "essence of things" and "of the nature of things in themselves." Those who want to know more profound information usually cannot clearly define their want. As all real knowledge is truth there can be no essential difference in the inmost nature of that information which we do possess from that which is still unknown. Another disparaging remark is, "We can neither explain our own existence nor the existence of so much as a pebble" (*ibid.*, p. 140); the real fact, however, is, that we can partly but not wholly explain both, and such explanation of

things in general is the object of every scientific research and of every one of the multitude of books which have been written on the numerous sciences. Does it not to some extent "explain our own existence," to know that every individual man is compelled to exist by the influence of natural powers and processes? Is it not better for man that his progress in knowledge is gradual, than that it should be effected by sudden methods more violent than he would be able to bear? As knowledge is far from complete in any subject, if we doubt a reliable statement because it is limited, we shall place ourselves in the irrational position of not believing anything however true it may be. The discovery of new knowledge by one class of persons, and the opposition to it by others, have a scientific basis—viz., both are a result of the operations of natural energy in accordance with the fundamental laws of science; they are a part of the conflict between the advancing and retarding sections of mankind, and necessary to regulate the rate of progress of civilisation. "Let knowledge grow from more to more" (Tennyson):

> "Who loves not knowledge, who shall rail
> Against her beauty? may she mix
> With men and prosper, who shall fix
> Her pillars? may her cause prevail."

53. Ignorance.

Ignorance has a scientific basis; physiologically it is inseparable from a deficiency of cerebral impressions; it is also associated with erroneous ones. It differs in every different person, and at every different period of life; it is greater the smaller the number and magnitude of true ideas and the larger that of false or unprovable ones. In comparison with the whole of existing knowledge each man's ignorance is immense, and with that of all possible knowledge it is practically infinite. In consequence of the physical property of the human brain to permanently retain strong impressions, if a man once acquires strongly-fixed ideas, whether true or false, he can never eradicate them, and this, in many cases, is the chief explanation of the impregnability of error; the brains of other animals possess a similar property, and many reliable instances are known of the tenacity of animal memory. The most important kind of ignorance is that of the great energies and principles which move and govern the universe, and of the chief rules of moral conduct founded upon them. As ignorance is usually absence of knowledge, many of the remarks already made respecting the influence of environment, etc., upon knowledge, apply in a converse form to it. The subject of ignorance is so great that to treat it exhaustively would require a large volume.

"Ignorance is unconsciousness of all those associations which constitute knowledge" (C. L. Morgan, "Springs of Conduct," 1872, p. 201). Just

as blind persons can only find their way about alone with moderate safety in places they know by experience, so can ignorant ones only manage tolerably well in matters of routine, and in those in which they have some empirical rule or dogma to guide them; but, like the blind are scarcely able to make any progress in ways out of their beaten track, so are ignorant persons largely helpless in cases out of their ordinary experience. An inexperienced man is unable to adapt his conduct to new circumstances such as everyone is occasionally placed in; witness the flurry of such persons, and of nervous ones when having to give evidence in a court of law and especially whilst being subjected to severe cross-examination; in a case of this kind, a really competent chemical analyst was induced by the opposing counsel in a court of justice to say that petroleum oil was an animal substance, a vegetable one, and a mineral one; such instances often occur.

"In the capacities of mankind there are three degrees: one man understands things by means of his own natural endowments; another understands things when they are explained to him; and a third can neither understand them himself, nor when they are explained by others" (D. Nasmith, "Makers of Modern Thought," 1892, vol. i, p. 46). Ignorance often leads to violence, persons who cannot understand each other readily disagree; a chief reason why sectarians quarrel with each other in their debates is because each defeats the other's object, and each tries stronger means of conviction, until they resort to violence. At the instigation of Calvin, in the year 1553, Dr. Servetus, who had written against the "Holy Trinity," was burned at Geneva. Unlike men of science, they do not agree in fundamental principles; if they did there would be no "religious atrocities"; science has no "atrocities." Ignorance of the fundamental truths of science is a necessary qualification for belief in some of the ordinary theological dogmas, and this proves that either the scientific principles or the theological dogmas are false.

"Nothing is so costly as ignorance. You sow the wrong seed; you build with the wrong timber; you buy the wrong ticket; you get into the wrong train; you settle in the wrong locality; you take the wrong medicine; and no amount of money can correct your mistake" (Bishop Taylor). "Ignorance is man's greatest foe," it debases every good desire and intention in him. Ignorant persons neglect themselves, neglect others, and thereby cause others to neglect them; they are often unpunctual; they just miss the train; they are too late for the steamboat; they are behind time at their work; they fail to be in time at the market or in securing employment, etc., etc., all of which means that they miss their opportunities, and do not succeed in life. An ignorant woman is a bad housekeeper. Maternal ignorance is often very injurious; ignorant mothers and nurses frequently frighten young children, and permanently injure their nerves and their minds by telling them untruths about black men, bogies, the devil, and hell. "In consequence of his profound ignorance, man, in all ages, has been directed in his pursuits by the mere impulse of his strongest

propensities, formerly to war and conquest, and now to the accumulation of wealth, without having framed his habits and institutions in conformity with correct and enlightened views of his own nature, and its real interests and wants. Up to the present day, the mass of the people in every nation has remained essentially ignorant, the tools of interested leaders, or the creatures of their own blind impulses, unfavourably situated for the development of their rational nature; and they, constituting the great majority, necessarily influence the condition of the rest" (Quotation by J. Fothergill, M.D., "Maintenance of Health," 1874, p. 392).

Ignorant men are like dumb-driven cattle, they run from one error into another; and are only induced to improve by the energies of Nature in the form of trials incessantly acting upon them; they are governed more by fear, and intelligent ones more by argument. Communities, societies, and sects are largely united together by unprovable ignorant ideas, and in many cases "the blind lead the blind," and travel together in mental slavery until death. Ignorance is real slavery; and unintelligent electors and worshippers are driven like an unreasoning flock of sheep by their political and spiritual directors; such cases of blind conduct are, however, as much consequences of the operation of great natural powers as those of intelligent behaviour. The more ignorant a man is of scientific principles, the more is his mind confused by conflicting ideas and feelings in profound subjects, and this is especially the case with devout persons when they find their sectarian beliefs proved to be false by the progress of science; it is those who know not what to expect who experience the most anxiety. Ignorance, fear, and terror go together; absence of knowledge has always caused a fear of comets, death, and various other natural phenomena. Ignorant persons fear intelligent ones, because they dread lest the powers which knowledge confers may be used to their injury.

The most ignorant persons are largely like children, they are fond of praise, they selfishly wish to have every pleasure and advantage at once; they all run in a crowd to see anything which attracts their attention, they are attracted by anything bright, moving, or noisy, they think that everything which they cannot at once understand is either a mystery or supernatural; and they attribute the greatest discoveries in science to accident instead of to long-continued labour. They are fond of asking unanswerable questions, such as "who created the earth?" why grass is green, the sun is yellow, the sky is blue, etc. A Creole lady, the teachers of whose children were paid by the hour, inquired, "How much, then, do they learn in one hour?" ("Truth and Opinion," 1840, p. 36) as if learning could be measured. Like infants are soothed by glittering baubles, they are consoled by mummery, awed by gilded pageantry and imposing ceremonials, they place confidence in unperformable attractive promises; they are delighted with small talk; relieved by frequently making complaints and by personal conflicts; they are especially fond of attacking and persecuting those of opposite opinions to themselves; similar to the lower

animals and the poor, they multiply fast, and are swept away in multitudes by disease.

All men are ignorant but in different degrees, the uneducated labourer and the scientific philosopher; ignorance affects both rich and poor, but the latter the most; ignorance of great scientific truths is not confined to criminals, but is very largely shared by the devout. Just as an ant in its own little community can only see a small distance around him, so can many men only perceive that which is immediate and palpable, and are largely unaware of the vast system of energies by which the universe and themselves are moved and governed; it is those who are ignorant of such science, not always the unpolite, who most retard the progress of knowledge.

The causes of ignorance are various; one of the chief is parental neglect; poor persons often have not much time in which to teach their children, and many have not the ability or desire; not possessing knowledge themselves they underrate its value; the ignorant poor produce untrained and criminal offspring. The absence of desire of mental improvement, and the time occupied in gaining a living are powerful sources of mental neglect; there are many persons who are too proud to learn. A great cause of ignorance is dislike of intellectual exertion; another is too much time being devoted by young persons to amusements; in consequence of love of pleasure they do not take the trouble to acquire sufficient knowledge to qualify themselves for the duties of life; and as wrong conduct is always punished, an ignorant person frequently becomes a pauper or a criminal; in a multitude of cases, brains and physical amusements do not run together. According to one writer, "the specific difference between an educated and an uneducated man is in the power of reflection" (G. H. Moore, M.D., "The Power of the Soul over the Body," 1846, p. 201). There is a Chinese saying: "The glory of a man is knowledge, but the glory of a woman is to renounce knowledge"; the latter half of this statement disobeys the scientific law of evolution. Wherever ignorance is encouraged, it sooner or later proves a curse; much of the idleness and poverty of Roman Catholic nations is due to secular ignorance; starved intellects ultimately produce starved bodies. The ignorance of large classes of the community on some subjects most essential to their own happiness is quite impregnable, largely because of defective training, and partly because nearly all men are wholly devoted to obtaining an income. Some persons dislike to acquire knowledge because it disturbs their religious beliefs; and multitudes of persons profess to find their "peace of mind" in ignorance, "they cry peace where there is no peace." And with others:

> "Thinking is but an idle waste of thought,
> And nought is everything, and everything is nought."
> —*Rejected Addresses.*

No man, not even the most learned, can adequately conceive the immensity of his mental emptiness; first, because he cannot realise the

vastness of present knowledge; and second, because he cannot imagine the incomparably vaster amount which remains to be discovered. Our knowledge is extremely finite, whilst our lack of it is practically infinite. Our ignorance of things and events is larger, the greater the period of time and distance in space which separates them from us; thus we usually know most about the circumstances which immediately surround us, whilst we know very little of the early history of man or of the events occurring on distant heavenly bodies. "We are taxed twice as much by our idleness, three times as much by our pride, and four times as much by our folly" (B. Franklin), and more than all by our ignorance.

In proportion to our ignorance the more we dislike to be informed of our defects; if you wish to make a man your enemy demonstrate to him that he is a fool. The greatest fools are those who learn nothing from their folly. To enumerate even a moderate proportion of the defects of mankind attributable to ignorance would be of comparatively little use unless available remedies could be suggested. Very ignorant persons often stubbornly resist improvement from without, and unless truths are actually dinned into their minds they will not accept them; advanced truths therefore require much reiteration. Just as a pig does not want a parlour but prefers to enjoy a sty, so a great number of persons desire no improvement in their mental state. The less a man knows, the less he wants to know, and the greater in many cases is his conceit; a person who advertised himself as "the only practical geologist in——," on being asked by the present writer what books he had read on the subject of geology, replied, "None of your rubbishing books for me, I larned from Natur, I did."

"There is no calamity like ignorance" (Richter). Wherever it exists there is always some bad consequence latent in it which will appear at any moment under suitable circumstances. An ignorant man is a curse to everybody, a danger to himself and to society; he is often a bad citizen, disobedient to the laws of Nature, and neglectful of moral rules because he does not understand them. "The true instruments of man's degradation is his ignorance" (Lady Morgan); many uninformed persons are worse than wild beasts because they do more injury to mankind, and cannot be so easily prevented. Ignorant workmen either waste, abuse, deface, or destroy, nearly everything they use or touch, they filch all they can; they think it a good act to make work by injuring property, and that injuring others benefits themselves; just like the hornet delights in stinging something, so they take pleasure in inflicting pain in order to show their power. The accompaniments of ignorance are nearly all that are bad.

Just like a man who has lost a leg has greater physical energy in other parts of his body, so he who is ignorant of one important subject is often the more impetuous and reckless in others; and as in the former case the man loses a considerable proportion of control over his general movements by the loss of his limb, so in the latter one, his wisdom and judgment in certain cases are weakened through ignorance of the subjects which would help him to control his recklessness. The "madness of crowds" and the

irrational fervour of fanatics is largely due to extra energy directed to one object, uncontrolled by suitable corrective knowledge. Ignorant persons prefer violent amusements; as in the case of excessive footballing, "scorching," etc., by young persons at the "reckless age."

Ignorance produces reckless men; men who are but little able to reason; if a man knows but little, he has but little upon which to found his faith or reasoning. A great number of accidents continually occur through the mental incapacity and defective moral training of the labouring classes. Numerous fearful explosions in coal-pits have been caused by miners taking into the mines matches, tobacco-pipes, and contrivances for opening safety-lamps; the men being so ignorant and reckless that they neither sufficiently value their own lives nor have the least regard for those of their comrades, nor for the sufferings of the widows and orphans caused by their recklessness, and all to gratify a selfish desire for smoking; they are too ignorant to be cured even by such fearful examples. Many large edifices, mansions, churches, cathedrals, etc., have been burned down through the ignorant recklessness of plumbers leaving their melting-pot fires on the roofs of buildings, also by careless smokers throwing lighted matches about; the London Alhambra, a large jute work in Dundee, and many other buildings have been destroyed in this way. Numberless fatal explosions have been caused by ignorant persons searching for leakages of coal-gas by the aid of an exposed flame; and very many fatalities caused by blind carelessness in the use of petroleum lamps by females. The physical recklessness of footballers and young cyclists is notorious, and the mental recklessness of blind sectarian believers is equally conspicuous; as men, able in other respects, used to firmly believe in witchcraft, so do some still recklessly believe in equally false ideas. The essential difference between a bold man and a rash one is, that whilst the former has evidence and truth to justify his action the latter has not, but goes blindly on regardless of evidence and consequences.

Ignorant workmen damage property intentionally "to make work," because they think "it is good for trade"; but this is a great mistake, because money is ill-spent when it can be spent better. An effect of ignorance in encouraging dishonesty is frequently seen in the very common practice of stealing their employer's time by ordinary labourers and workmen. Who are the lawless everywhere? they are the ignorant and the designing; there are many men who feel pleasure when they have succeeded in taking a base advantage of others; but "a rogue is a roundabout fool" (Adams), and he who injures another frequently more injures himself.

According to one writer, "a large number of men know nothing of physical science, and are apparently none the worse for their ignorance" (W. H. Mallock, "Is Life Worth Living?" 1882, p. 245); but the apparent is often very different from the real, and it does not require much intelligence to perceive that they must really be the worse for it. It is true that some persons *appear* none the worse for their ignorance until the time of

trial in the particular subject arrives, and that may be soon or late; but when it does come, then the ignorant persons, and often many innocent ones with them, have to suffer the painful consequences. A prudent man usually lays up a stock of knowledge as he does of money, ready for the hour of need; but in a vast number of cases, uninformed persons culpably neglect to "provide for a rainy day." Whilst an unintelligent person is strong for evil and feeble for good, an intelligent one is the reverse. "He that voluntarily continues ignorant is guilty of all the crimes which ignorance produces; as to him that should extinguish the tapers of a lighthouse might justly be imputed the calamities of shipwrecks" (Dr. S. Johnson).

The powers of Nature, by invariably punishing us for our thoughtless acts, incessantly warn us to seek knowledge, and in this way ignorance indirectly stimulates self-improvement. Neither the laws of Nature nor those of courts of justice absolve a man from punishment, on an excuse of ignorance, or even on a plea that he intended to do right, and thought he was doing so; a man who, by his ignorance or neglect, kills another, is guilty of manslaughter. "Ignorance of the law, which every man is bound to know, excuses no man" (Burrill). He who through culpable ignorance or wilfulness neglects to preserve his own life, is in some degree a suicide.

"Most, if not all, our illnesses are the result either of our ignorance or our indiscretion" (P. Hood, "Treatise on Gout," 1879, p. 383). "It is not improbable that as many lives are lost from ignorance, as from indiscreet management of the health and habits (*ibid.*, p. 385). Napoleon nearly lost the battle of Leipsig through careless eating (*ibid.*, p. 387); other examples are given. As poor persons live on coarse physical food, so ignorant ones are content with unwholesome mental food. Ignorance of any one of the chief conditions of physical and mental health often prevents persons from securing and maintaining it, and multitudes of men are carried prematurely into their graves, or become insane simply from this circumstance; they are unable to alter their customs, and only make an attempt to do so when "death stares them in the face"; they expect the doctor to do for them that which is beyond his power, and which they ought to be able to do for themselves, viz., to continually regulate their diet, exercise, and regimen. Those who are ignorant and conceited usually repent too late.

Ignorance is the source of nearly all human errors; few men would do wrong if they could completely realise the whole of the consequences, immediate and future, of their wrong acts; but this would be impossible because of their limited knowledge and intellect. By doing a wrong act a man usually causes persons to consider him either a fool or a rogue; wrong-doing is ignorant-doing all the world over. "Is there any fundamental difference between the savage coming to destruction through ignorance of the law of gravitation, and the civilised European coming to madness through ignorance of the laws of his own nature, and the laws of the nature of things and men around him?" (Maudsley). Ignorance often leads to insanity; Hippocrates maintained that every vice was an effect of

insanity (*ibid.*, "Responsibility in Disease," 1874, p. 26); and this opinion is largely correct.

Ignorant good intention is often as evil in its effects as intentional wickedness. "There has been no more gigantic power of destruction from the beginning of the world until the present time than this 'Meant-well-but-didn't-know.' It was 'Meant-well' who, with good intentions, became the pilot of a ship and ran it on the rocks. It was 'Meant-well' who, a few years ago, in Western Massachusetts, built a reservoir that he thought would hold the waters, but which burst beneath their pressure, and destroyed the whole valley, devastated village after village, ruined property and human life. He meant well, but he was ignorant. It was 'Meant-well' who built the bridge at Angola, and yet, in spite of his good intentions, the train plunged through, and darkened a hundred homes. It was 'Meant-well' who constructed that great mill at Lawrence; but not understanding the laws of the strength of materials, not dealing fairly and truly by those eternal forces of Nature to which every man must first or last give account, the mill was crushed beneath the weight of its enginery, and its human freight, and carried down one shrieking mass of ruin. It was 'Meant-well' who, in the person of Philip II. of Spain, pursued such a disastrous career. I believe there has been no ruler in all history who has sat on any throne of whom it could be more truly said that he meant well. He was the incarnation of a certain kind of conscience, and he pursued his whole career under the inspiration and guidance of what he thought to be religion—the will of God. And yet it is said that he never smiled in his life except when he heard of the massacre of St. Bartholomew. His reign was one of the most conscientious and best-intentioned, one of the most religious, and at the same time the most immoral and execrable that Europe has ever seen. It is not enough, then, to mean well. There must be intelligence." He "thought he was doing God service to establish the Inquistion," he "thought he was doing God service to be the means of putting to cruel torture and horrible death thousands of innocent old women and children on the charge of witchcraft,"—"these atrocities were none of them conscious and purposed cruelty." "It was not conscious cruelty, it was ignorant mercy that built the Inquisition" (M. J. Savage, "The Morals of Evolution," 1887, pp. 134, 135, 143, 144). Nearly all the greatest religious persecutors have been men of ignorant and narrow views (Buckle, "History of Civilisation," vol. i, p. 184). "There is no instance on record of an active ignorant man who, having good intentions, and supreme power to enforce them, has not done more evil than good" (*ibid.*, vol. iii, p. 167). "Nothing is more terrible than active ignorance" (Bossuet). Ignorance crucified Jesus Christ, burned Bruno, imprisoned Galileo, and has until now incessantly supported unprovable dogmas and opposed men of science in their labours for the discovery of knowledge. It was ignorance which recently caused the Roman Catholic judge of Taxacapa to burn ten heretics, and to say that God had ordered him to do it (see p. 426); it is ignorance that, by Papal decree, asserts

itself to be "infallible" in matters of faith and morals; that permits and encourages persons to firmly believe in "transubstantiation"; that a woman was "the mother of God," and a number of other assertions. Belief in unprovable ideas is heathenish; and the mind which has fixed false ideas in serious questions is poisoned beyond recovery.

The following is a notorious instance of the evil which results from ignorant fanaticism:—The "Massacre of St. Bartholomew, an atrocious carnage that took place in France on the night of St. Bartholomew's Day, 1572. The King, Charles IX, at the instigation of his mother, Catherine de Medici, the Queen-Dowager, invited to Paris, under a solemn oath of safety, the principal Protestants of the kingdom, in order to celebrate the marriage of the King of Navarre with the sister of the French King. On a given signal at midnight the massacre commenced; men, women, and children were involved in one common destruction. The city resounded with the groans of the dying, the dead bodies were cast into the streets, and the channels flowed with blood. In Paris alone it is said that more than 10,000 persons were put to death on that night. But the butchery was not confined to Paris; at Orleans, Rouen, Meaux, and other places throughout France similar cruelties were perpetrated; so that in all, according to Sulley (whose account is the generally received one), 70,000 persons were massacred on this occasion. Pope Gregory XIII ordered special religious services and public rejoicings for this destruction of heretics" (Beeton's "Dictionary of Science," vol. i, p. 228; Cooper's "Biographical Dictionary," 1873). "From the time of this most atrocious order, given by Charles himself, he was taken ill, and languished with bodily pains until relieved by death in 1574" (Maunder's "Treasury of History, p. 593); "154,000 Protestants were massacred in Ireland during O'Neill's rebellion in the year 1641" (Haydn's "Dictionary of Dates," Art. "Massacres"). The Jews have been fearfully persecuted by all other nations and sects; the Catholics also. "Between the years 1530 and 1603 two hundred thousand Englishmen were starved, executed, punished, and imprisoned for their adherence to the old faith, Catholicism" (F. Molloy, "Faiths of the Peoples," 1892, vol. i, p. 26). Unrestrained bigotry and fanaticism are usually more dangerous than unlimited ambition, because ambition is only the influence of one man, whilst bigotry is that of thousands. "Persecution is not wrong because it is cruel, but is cruel because it is wrong" (Archbishop Whately, "Detached Thoughts and Apothegms," 1856, p. 121).

The greatest crimes are consequences of ill-regulated desires (Aristotle), and none have been greater than those committed under the influence of a wish to "save souls." A few hundred years ago, "thousands of victims were burned alive upon suspicion of witchery and heresy by batches of twenty, two hundred, four hundred at a time, even in small towns, and the burnings were regarded as popular festivals, witchery being considered as the working of Satan and heresy"; even Martin Luther said: "I would have no compassion on these witches, I would burn them all." Under the

influence of the Papal Inquisition, between the years 1481 and 1808, no less than 34,658 persons were burned alive, and 228,214 persons were condemned to the galleys or to imprisonment by that tribunal (Sir R. Phillips, "A Million of Facts," p. 1091). The intolerance and cruelty of sectarians has always been directly proportionate to their power and their ignorance of science, and has been nearly as great with Protestants as with Catholics.

An ignorant person is rarely highly moral; first, because it requires knowledge to enable us to do unto others as we would have them do unto us; second, because in the numerous difficult cases which occur with all men in going through life, an ignorant man is often unable to determine what is right; and third, because it requires knowledge and reasoning-power to predict the consequences of our acts, and to distinguish truth from error. A proof of the truth of the last of these statements is shown by the facts that unintelligent men are frequently the victims of plausible and misleading orators, and injure the governing power of a nation by voting for the election of incompetent Members of Parliament. Mankind are universally gullible in proportion to their ignorance of the particular subject in question; and especially in profound or complex matters such as politics, sociology, and theology; witness the large number of contradictory political doctrines, abortive social schemes, and conflicting theological sects, the latter numbering several hundred at the present time in this country alone.

A serious result of ignorance is that it induces men to accept plausible false statements and reject true ones, because the former can be more easily understood. Weak minds believe in large promises, strong minds question them. Many ignorant persons think it is a virtue to believe without evidence, and this weakness is taken advantage of to support irrational socialistic and theological doctrines; and unrealities are solemnly held up before the gaze of mankind as being the greatest of truths. "There is nothing so absurd, false, or prodigious, but either out of affection of novelty, simplicity, blind zeal, hope and fear, the giddy-headed multitude will embrace it, and without examination approve it" (Burton). "None want reasons to confirm their will" (Pope).

> "There is none
> So visionary, or so void of sense
> But he will find a crowd to follow him!"
>
> —*Longfellow.*

The demand practically made by the public for falsity both in trade and religion is enormous; and its influence is so great that both tradesmen and ministers of religion are largely compelled to yield to it. Cheap goods, cheap religion, cheap everything, is generally demanded; and many things are adulterated and debased in order to suit such demand. "A people's religion is, and ever must be, a corrupt religion" (W. S. Lilly, "Ancient Religion and Modern Thought," 1885, p. 335); it is

corrupted by personal desire. The Christian religion does not equal in altruism and goodness, the doctrines of its founder (see "Modern Christianity a Civilised Heathenism," 8th thousand, 1874). The dogmatic portion of modern Christian theology is largely an adulterated article adapted to suit the ideas of ignorant or selfish persons who are willing to pay for it. In all religions, preaching and proselytising is largely practised as a profession by which to obtain an income; a natural consequence of this is that ignorance is pandered to and encouraged. "Believe and do not examine" (Chateaubriand) is essentially the advice or command generally given to those who seek "eternal salvation." The subjection of the human reason to the slavery of dogma, and irrational desire, is preached as being the highest duty. According to the late Cardinal Newman, "Taking human nature as it is, superstition is the sure companion of faith, when vivid and earnest. . . . We may surely concede a little superstition as not the worst of evils, if it be the price of making sure of faith" (W. S. Lilly, "Ancient Religion and Modern Thought," 1885, p. 286); this expresses the view extensively held by those who "speak with authority" in matters of religion, and who profess to lead mankind into "the truth." "A little superstition" is only a little untruth, but which in very many cases has led to fearful crimes, such as the recent burning of heretics in Mexico, the Armenian atrocities, etc.

Acquisition of knowledge in matters of religion is a great sin according to some theologians. "A Catholic is not allowed to inquire into the truth of his creed" (Cardinal J. H. Newman, "A Grammar of Assent," 1870, p. 184); hence he is kept in ignorance as to whether his most fundamental beliefs respecting his eternal salvation or damnation are founded upon truth or upon error. Liberty to examine the truth or falsity of those ideas upon which their eternal happiness or misery is supposed to depend is a right of all men, as much so as the right to use the light of day. As each man has to largely suffer the punishments of his own ignorance, it is his duty to adopt all proper means of avoiding them. A day of reckoning invariably comes for all persons, sects, or nations, who neglect to acquire fundamental knowledge, or who knowingly prevent others from doing so; and the mere antiquity of dogmas does not preserve them from decay; many have already disappeared, and others are following them.

Ignorance of fundamental subjects has a profound effect upon the character of those who are afflicted by it, and we have only to compare the condition of Catholic nations, of Mexico, Spain, Portugal, and a large portion of Ireland, with that of more intelligent ones, to perceive the paralysing effect of such ignorance upon industry; it makes both a man and a nation "rotten at the core." "They who allow oppression share the crime," and they who induce or compel a man to be ignorant share his guilt. "Ignorance, sheer black ignorance, is, in Dr. Dillon's opinion, at the bottom of the decadence of Spain. Of the population of eighteen millions, sixteen millions, he says, are illiterate." "Monumental ignor-

ance of contemporary history and modern languages has left its abiding mark on the ruling classes in Spain, and is to a large extent answerable for the irreparable calamities which have overtaken the brave, patient, and noble-minded people" ("The Ruin of Spain," Dr. E. J. Dillon, *Contemporary Review*, June, 1898; see *Review of Reviews*, June, 1898, p. 563). "In 1881, 21·4 per cent of the men and 23·2 per cent of the women in Ireland who were married signed the register by their mark." "In Scotland the average percentage of attendance of children at school is 80; in Ireland, 52" (*Contemporary Review;* see *Review of Reviews*, April, 1898, p. 376). "Few social evils are of greater magnitude than uninstructed and unchastened religious fanaticism; no personal habit more surely degrades the conscience and the intellect than blind and unhesitating obedience to unlimited authority" (T. H. Huxley, "Social Diseases *v.* Worse Remedies," 1891, p. 58); and this is especially true in the case of untrained peasants who are largely under the influence of priests.

Whenever a man is ignorant he is liable to be misled by fluent orators, misleading agitators, specious company promoters, untruthful advertisers, unscientific priests, etc., many of whom are either as ignorant as himself in the particular subject, or gain an income by their occupations; and women are usually more easily misled than men, because they have usually less knowledge. The successful perpetration of numerous frauds by directors of companies has been chiefly due to the ignorance of the essential circumstances of the cases by the shareholders. In these ways ignorance encourages deceit, untruthfulness, commercial frauds, pious impostures, and blind belief in statements without adequate evidence. The crafty man seeks the support and applause of the ignorant: "If there were no fools there would be no rogues" to impose upon them; if men do not read or learn they will not doubt, if they do not doubt they will not inquire, and if they do not inquire they will not disbelieve their deceivers. It has been said that "one half of mankind is occupied in deceiving the other half." The enormous success of roguery, quackery, and imposture, proves the great amount of ignorance and craftiness, the extent to which the blind are led by the blind and by the designing. Both the saint and the sinner, either ignorantly or knowingly, largely practise deception.

Ignorant methods of trying to do good to others, although the desire is praiseworthy are often attended by great drawbacks of "evil"; and whilst intelligent benevolence is a real aid to the poor and deserving, ignorant philanthropy develops paupers and hypocrites. Zeal is often stronger than wisdom, and the less blood there is in the brain the more there is in the other organs. Many of the schemes for "converting" and helping the poor instead of going to the root of the matter by instructing them how to educate, train, and help themselves, are largely of this kind; very few of them touch the real cause of the evil, viz., secular ignorance and defective moral training, and the consequence is that they sooner or

later fail. The main questions to be considered when giving support to such schemes, appear to be, is the good they do greater than the evil? and can the latter be diminished? Ignorant charity is often associated with deficiency of more useful occupation; indiscreet giving causes unreasonable expectations and renders pauperism unmanageable; the greater the amount of aid given to untrained persons the more they consider they are entitled to receive, until their expectations so expand that they eventually consider that all the land, and the pecuniary and other possessions of the rich, have been stolen and belong by right to them; many working-men are afflicted with this error. There is much charity which has a demoralising effect, and is a curse to those who give and those who receive. "Charity covers a multitude of sins," because much of it is restitution, it gives back to the multitude some of the money it has received from them; and much of it is "robbing Peter to give to Paul." "Ignorance and unwise affection defeats itself; it hinders those whom it would help, and harms those whom it desires to succour and to bless" (T. R. Birks, "First Principles of Moral Science," 1873, p. 105). "Blind and ill-judging philanthropy is one of the chief moral dangers of our time' (*ibid.*, p. 108). It has been estimated that "£27,000,000 is annually spent in British charity," in a large degree wasteful.

Misdirected help of those who do not help themselves is a common circumstance; the following is an example, and is "the result of an experiment made by the Poor-law Union of St. Olaves, London, in dispensing outdoor relief. They resolved to dispense with those salutary tests of destitution which experience has shown to be necessary; "this Board opened a labour-yard for the relief of able-bodied men, but neglecting the advice that applicants are to receive not wages but relief proportional to their necessities, the guardians determined to pay their relief on the scale of trades-union wages. The labour-yard remained open from January 7th till March 28th; during that period 61,617 days of employment were given at a cost of £10,782, exclusive of cost of management. The total expenditure was about £18,000. The stone broken cost the guardians" (and therefore the ratepayers) "£7 per ton as compared with four shillings, which is said to be the cost of the same work in the open market. The relief was not effectual for the purpose intended." "A large proportion of the men did no work at all, and many absented themselves from the yard until the hour of payment arrived; some of the payment was given in kind, and the tickets and groceries so distributed were in many cases exchanged for drink." Similar results have occurred in many other cases. In a recent one in South Wales, simply because they could not obtain exactly the wages they chose to ask for their labour, a large number ("4,700") of able-bodied miners, with plenty of work offered them at an enhanced price, refused to work, threw themselves upon the poor-rates, made themselves paupers and vagrants, lost their qualifications as voters, and a sum of about "eighteen thousand pounds" was paid from the poor-rates to relieve them, a large portion of which was surcharged upon the

Guardians by the Auditor of the Local Government Board. It is a just requirement that "he who will not work, neither shall he eat."

The persons who are the most capable of instructing others are those who have been themselves instructed, for when a man has reformed himself he reforms others by his example, and we all know that "example is stronger than precept," and that "deeds are more effectual than words." Many of the benevolent persons who wish to diminish the privations and sufferings of the poor are too deficient in knowledge to be well able to do it; this fact is illustrated by the number of comparatively inefficient associations pottering with great evils by using palliative instead of preventive measures; nevertheless, temporary palliative methods must be employed as aids until more effectual ones can be fully carried out. Many ignorant persons teach first and learn afterwards (A. De Morgan). All such shortcomings are more or less justified by necessity.

No amount of learning or intelligence in one subject will compensate for deficiency in another, especially if the latter is of a more comprehensive character. "He that doth not know those things which are of use to him to know, is but an ignorant man whatever he may know besides" (Tillotson). Culture without fundamental knowledge is not an uncommon qualification, and is in many cases quite as conspicuous in the more polished classes of society as in the uncultured ones; in persons who are educated in colleges, as in those who are not so instructed. Notwithstanding that many teachers of religion are refined and entertaining persons, it is surprising how little knowledge is shown in their writings respecting the omnipotent powers and immutable laws which govern the universe and mankind, the scientific foundations of morality, or the proper methods of discovering truth and detecting error; they treat the greatest truths of science as if they were as uncertain as their own unprovable theological beliefs, and as if they had no relation to religion. Dr. Jessop has observed that "the leaders in thought and culture, in mathematical and physical sciences, in history, linguistics, even in classical learning—the leaders in literature in its widest acceptation—are no longer to be found among the ordained clergy of the Church of England, but outside their ranks. One fact alone may serve as a most startling confirmation of these assertions. In 1843 there were ninety Fellows of the Royal Society who were in holy orders; in 1893 the names of no more than sixteen" (*Review of Reviews*, July, 1893, p. 59). Any course of education which leaves a leading man ignorant of the greatest of all truths must be a seriously defective one. A national prelacy and priesthood, possessing adequate knowledge of those truths, remain to be formed.

When cultured persons themselves affirm, and uncultured ones are continually assured by their spiritual advisers, that unproved dogmas are "absolutely certain knowledge," and that all their present sufferings will be recompensed by "eternal happiness" in a life to come, and become convinced that this is true, their desire to acquire natural knowledge is diminished, and their fundamental ignorance remains unalleviated.

Ignorance of the energies of Nature and of the great truths of science, by sectarians and their teachers, is continually postponing the day of relief of mankind from bodily and mental sufferings, and retarding the advent of the multitude of blessings which science has in store for mankind.

Who are the persons who usually oppose new knowledge? it is either those who are the least intelligent in the particular subject, or who are personally interested in opposing it. Who have opposed the introduction of new processes and machinery in manufacturing operations? it has almost invariably been either ignorant or interested operatives. Why is it that in cases of strike and lock-out the workmen and their leaders have been so much more frequently defeated than the masters? it has usually been because the masters have been more intelligent in the particular subject, and their conduct more consistent with the great scientific principle of evolution. Who are the chief promoters of strikes? the leaders and agitators who gain a living by them. Who is it that most oppose the extension of physiological knowledge by means of scientific experiments? it is usually "anti-vivisectionists" who are highly ignorant of the principles of science and inexperienced in scientific methods and research. Who have most opposed the progress of new knowledge? it has been personally interested ecclesiastics having but little acquaintance with fundamental science; ministers and priests have during centuries past been behind the times in such information; Martin Luther and Calvin were in deadly opposition to science. Priests obtain the assistance of women and the least intelligent of their congregations in their opposition to the progress of knowledge (Hamerton, "The Intellectual Life," p. 170). Whilst the intelligent and scientific portion of mankind have to perform the labour of advancing human improvement the unscientific classes have to bear the dubious reputation of retarding it.

It requires the entire intellectual energy of a nation to overcome the great opposition of popular ignorance. The retarding effect of ignorance of science upon human progress and the amelioration of human misery, has for hundreds of years been, and still is, enormous. Bruno, who taught Copernicus astronomy, was imprisoned two years for doing so, and by Roman Catholic orders put to death "as mercifully as possible and without the shedding of blood," *i.e.*, he was burned alive. "Learning perished where Luther reigned" (Erasmus); both he and his colleague Melancthon allowed no questioning the inspiration of the Scriptures. He denounced learned men as "locusts, caterpillars, frogs, and lice," and reason as the "archwhore," and the "devil's bride"; Aristotle as a "prince of darkness, horrid impostor, public and professed liar, beast, and twice execrable." He spoke of the great discoverer Copernicus as an "upstart astrologer," a "fool who wishes to reverse the entire science of astronomy," for "sacred Scripture tells us that Joshua commanded the sun to stand still, and not the earth" (Clodd, "Pioneers of Evolution," 1897, pp. 80, 82). The Protestant Reformation did not free the human mind from the tyranny of unprovable theological beliefs, but fettered it more, by

arresting the spirit of inquiry, by inducing everyone to place faith in mere Scripture written by men unacquainted with science, and by compelling men to go to the Bible for secular knowledge. Abundant evidence exists to prove that in cases where the amelioration of human misery by means of new knowledge conflicts with sectarian unproved beliefs, the holders of such dogmas retain their irrational beliefs and sacrifice their fellow-creatures; even at the present time theologians have not taken the trouble to think out a scientific basis of morality for the benefit of mankind. As we now wonder how our ancestors could possibly have believed in the existence of fairies, dragons, witches, etc., so will our descendants probably be amazed to think that any rational being could believe in the various selfish and unprovable ideas firmly entertained by various religious sects. Nevertheless, whatever is must be until sufficient causes arise to prevent it; conversion from ignorance to knowledge is a very slow progress.

Ignorance of fundamental science is at the bottom of all sectarian opposition to the discovery of new knowledge. The clergy of Oxford and Cambridge prevented Dr. Priestley accompanying Captain Cook on his memorable expedition in the year 1772 (Weld, "History of the Royal Society," vol. ii, p. 56; A. D. White, "The Warfare of Science," 1876, p. 69). "The Dominican father Caccini insisted that 'geometry is of the devil'" (A. D. White, *ibid.*, p. 36). It is not so very long ago since geology was declared by ministers of religion to be "not a subject of lawful inquiry," "a dark art," "dangerous and disreputable," "a forbidden province," "infernal artillery," and "an awful evasion of the testimony of revelation" (Pye Smith, "Geology and Scripture," pp. 156, 157, 168, 169; A. D. White, *ibid.*, p. 119). By Dean Cockburn, "from his pulpit in York Minster, Mary Somerville was denounced coarsely by name for those studies in physical geography which have made her honourable throughout the world" (*ibid.*, p. 121). "In Scotland at the beginning of this century the use of fanning-mills for winnowing grain was denounced as contrary to the text 'the wind bloweth where it listeth'" (*ibid.*, p. 133). "The introduction of railways into France was declared by an archbishop to be an evidence of the divine displeasure against country innkeepers who set meat before their guests on fast days, and now were punished by seeing travellers carried past their doors" (*ibid.*, p. 134). "At one period, on account of expressions in Ezekiel, any map of the world which did not place Jerusalem in the centre was looked on as impious" (*ibid.*, p. 135). Then there was "the opposition of conscientious men to the taking of the census in Sweden and the United States, on account of the terms in which the numbering of Israel is spoken of in the Old Testament" (*ibid.*, p. 136). "Bishop Dupanloup stigmatised Darwin, Huxley, Lyell, and others, as authors of 'shameful theories' and made special use of the phrase of a naturalist that 'it is more glorious to be a monkey perfected than an Adam degenerated'" (*ibid.*, p. 139). And as recently as the year "1868, several excellent clergymen in Prussia thought it their duty to meet for the denunciation of 'science falsely so-

called'" (*ibid.*, p. 142). "Do conscientious Roman Catholic bishops in France labour to keep all advanced scientific instruction under their own control—in their own universities and colleges? so do very many not less conscientious Protestant clergymen in our own country insist that advanced education in science and literature shall be kept under control of their own sectarian universities and colleges, wretchedly one-sided in their development, and miserably inadequate in their equipment:—did a leading Spanish university, until a recent period, exclude professors holding the Newtonian theory? so does a leading American college exclude professors holding the Darwinian theory; have Catholic colleges in Italy rejected excellent candidates for professorships on account of 'unsafe' views regarding the Immaculate Conception? so are Protestant colleges in America rejecting excellent candidates on account of 'unsafe' views regarding the Apostolic Succession, or the Incarnation, or Baptism, or the Preservation of the Saints" (*ibid.*, p. 143). The Papal Government opposed the opening of the Rome and Naples railway in 1862 ("Haydn's Dictionary of Dates," 1878, p. 642). The chief explanation of these and many more similar cases is ignorance of the fundamental truths of science. As the conduct of all men is really determined by natural influences in accordance with those truths, it is not so much a matter of blame as a question whether religionists will take the trouble to learn the great laws and principles of science, or continue to act as a constant hindrance to the progress of new knowledge? The real "atheists" and "heretics" are those who persistently neglect fundamental knowledge, and who need scientific missionaries to convert them; it is they rather than men of science who are "so near to death, and yet so far from God" (Longfellow); they do not seem to comprehend that dogma is not necessarily truth, nor that there is the omnipotent power of the universe behind all the great truths of science which gradually upsets all that is false or erroneous. Both knowledge and ignorance are always on their trial; the real "day of judgment" is now and at all times.

Ignorance has always persecuted genius and originality:—"Aristotle, after a long series of persecutions, swallowed poison. Socrates, a sculptor and philosopher, born about 469 years before Christ, was one of the wisest of men, who considered that religion must not be based upon fables, and whose maxim was that virtue and wisdom are inseparable, was charged at Rome, when he was more than seventy years old, with having despised the gods, was condemned to death, and compelled to drink in public a poisonous infusion of hemlock. The great geometricians and chemists, Gerbert, Roger Bacon, and others, were abhorred as magicians; Virgilius, bishop of Salzburg, having asserted that there existed antipodes, the Archbishop of Mentz declared him an heretic, and consigned him to the flames; and the Abbot Trithemius, who was fond of improving stenography, or the art of secret writing, having published some curious works on that subject, they were condemned as works full of diabolical mysteries. Galileo was condemned at Rome publicly to disavow his sentiments regarding the

motion of the earth, the truth of which must have been abundantly manifest; he was imprisoned by the Inquisition, and visited by Milton, who tells us that he was then poor and old. Cornelius Agrippa, a native of Cologne, and distinguished by turns as a soldier, philosopher, physician, chemist, lawyer, and writer, was believed to be a magician, and to be accompanied by a familiar spirit in the shape of a black dog, and was so violently persecuted that he was obliged to fly from place to place; the people beheld him as an object of horror, and not unfrequently, when he walked, he found the streets empty at his approach. When Urban Grandier, another victim of the age, was led to the stake, a large fly settled on his head; a monk, who had heard that Beelzebub signifies in Hebrew the god of flies, reported that he saw this spirit come to take possession of him. Even the learned themselves, who had not applied to natural philosophy, seem to have acted with the same feelings as the most ignorant; for when Albertus Magnus, an eminent philosopher of the thirteenth century, constructed an automaton, or curious piece of mechanism, which sent forth distinct vocal sounds, Thomas Aquinas (a celebrated theologian) imagined it to be the work of the devil, and struck it with his staff, which, to the mortification of the great Albert, annihilated the labour of thirty years. Descartes was horribly persecuted in Holland when he first published his opinions; Voetius, a person of influence, accused him of atheism, and had even projected in his mind to have this philosopher burned at Utrecht in an extraordinary fire, which, kindled on an eminence, might be observed by the seven provinces. This persecution of science and genius lasted till the close of the seventeenth century" (I. Disraeli). Columbus was sent home in chains after his discovery of America; and it is evident that:—

> "He who surpasses or subdues mankind,
> Must look down on the hate of those below."
>
> —*Byron.*

> "Oh, fear not in a world like this,
> And thou shalt know ere long,
> Know how sublime a thing it is
> To suffer and be strong."
>
> —*Longfellow.*

The death of Socrates, "the father of philosophy," fitly illustrates the incompatibility of knowledge and ignorance. His labour was "directed to the establishment of true moral and religious principles, in opposition to the false and mischievous principles which he observed were commonly acted upon and avowed in the world. The excellency and supremacy of self-knowledge is what he was ever inculcating; and of self-knowledge not as a matter of intellectual curiosity, or for its value as a science, but in order to self-government and to happiness." . . . "He is said never to have been weary of investigating" ("Beeton's Dictionary of Science," vol.

ii, p. 769). He maintained that "virtue and wisdom are inseparable," but he was sentenced to take poison in public "as a contemner of the gods" ("Cooper's Biographical Dictionary"). His death is thus described by his friend and disciple Plato: "And Crito, hearing this, gave the sign to the boy who stood near. And the boy departing, after some time, bringing with him the man who was to administer the poison, who brought it ready bruised in a cup. And Socrates, beholding the man, said, 'Good friend, come hither; you are experienced in these affairs, what is to be done?' 'Nothing,' replied the man, 'only when you have drank the poison you are to walk about until a heaviness takes place in your legs; then lie down; this is all you will have to do.' At the same time he presented him the cup. Socrates received it from him with great calmness, without fear or change of countenance, and regarding the man with his usual stern aspect, he asked, 'What say you of this potion? Is it lawful to sprinkle any portion of it upon the earth as a libation or not?' 'We only bruise,' said the man, 'as much as is barely sufficient for the purpose.' 'I understand you,' said Socrates, 'but it is certainly lawful and proper to pray the gods that my departure from hence may be prosperous and happy, which I indeed beseech them to grant.' So saying, he carried the cup to his mouth, and drank it off with great promptness and facility.

"Thus far most of us had been able to refrain from weeping; but when we saw that he was drinking, and actually had drunk the poison, we could no longer restrain our tears. And from me they broke forth with such violence that I covered my face and deplored my wretchedness. I did not weep for his fate so much as for the loss of a friend and benefactor, which I was about to sustain. But Crito, unable to restrain his tears, was compelled to rise. And Appolodorus, who had been incessantly weeping, now broke forth in loud lamentations, which infected all who were present except Socrates. But he, observing us, exclaimed, 'What is it you do, my excellent friends? I have sent away the women that they might not betray such weakness. I have heard that it is our duty to die cheerfully, and with expressions of joy and praise. Be silent, therefore, and let your fortitude be seen!' At this address we blushed, and suppressed our tears. But Socrates, after walking about, now told us that his legs were beginning to grow heavy, and immediately lay down, for so he had been ordered. At the same time the man who had given him the poison examined his feet and legs, touching them at intervals. At length he pressed violently upon his foot, and asked if he felt it, to which Socrates replied that he did not. The man then pressed his legs, and so on, showing us he was becoming cold and stiff. And Socrates, feeling it himself, assured us that when the effects had ascended to his heart he should then be gone. And now the middle of his body growing cold, he threw aside his clothes, and spoke for the last time, 'Crito, we owe the sacrifice of a cock to Æsculapius. Discharge this and neglect it not.' 'It shall be done,' said Crito; 'have you anything else to say?' He made no reply, but a moment after moved,

and his eyes became fixed. And Crito, seeing this, closed his eyes and mouth."

Ignorance and bigotry have always hated and injured the most learned and moral of men. Ignorance delights to dwell in darkness, in the "mystery of evil," the "mystery of pain," the "mystery of free-will," the mystery of "Divine interference," etc., as if they included some occult action inconsistent with natural power and law. Ignorant persons are usually poor in happiness, and riches only make them more so, because they are incapable of making the best use of their possessions. Weak minds can usually neither bear much success, nor great failure. An irrational fear of death is another symptom of mental incapacity, as if death was a mysterious supernatural event; "death and ill fortune are continual bugbears to the weak-minded, the irreligious, and the ignorant; and whilst such exist in the world divines will preach upon its impiety and philosophers discourse upon its absurdity in vain" (C. Mackay, "Extraordinary Popular Delusions," 1852, vol. i, p. 261).

> "Oh what a glory doth this world put on
> For him who, with a fervent heart, goes forth
> Under the bright and glorious sky, and looks
> On duties well performed, and days well spent!
> He shall so hear the solemn hymn, that Death
> Has lifted up for all, that he shall go
> To his long resting-place without a tear."
>
> —*Longfellow.*

Contradictories cannot coexist; ignorance and intelligence never did agree, and never can, simply because they contradict each other; ignorance opposes intelligence everywhere. The ignorant husband or wife cripples the intelligent partner. The poor in knowledge are a burden and a trial to the intelligent; this is as true of nations as it is of individuals; much of the difficulty between the English and Irish nations has arisen from this circumstance. The Chinese and more civilised nations are nearly always at variance; and the intelligent whites and ignorant blacks in the Southern States of America continually disagree (see "Black America," 1891, by W. L. Clowes). Everywhere intelligent persons constitute the advancing, and ignorant ones the retarding sections of mankind; the endless conflict between the old and new, between civilisation and barbarism, are illustrations of this general truth. The retarding section of mankind include savages and unscientific persons of all nations.

A very common characteristic of ignorant persons is a disregard of the rights of others; they are frequently deficient in the cardinal virtues of justice, obedience to law, honesty, truthfulness, industry, punctuality, etc., and notwithstanding their good intentions or religious professions, they commit a variety of immoral acts; it is well-known that many of the blacks in Virginia and Carolina are very pious, and equally dishonest and bestial. It is ignorance which largely helps to fill the bankruptcy and criminal

courts with defaulters, and the gaols with prisoners. Various trade-union societies largely neglect, in several ways, the rights of employers and of the public. It is the untrained factory-hand who, instead of training himself to punctuality, requires the luxury of a "steam-hooter" to compel him to go in proper time to his work; who, rather than improve himself, injures the sick and afflicted all around, and disturbs a multitude of his fellow-citizens. If there were no laggards there would be no "steam-bulls":—

> Many things are "bad," most might be worse,
> The laggard's "hooter" is the sick man's curse.

Another common effect of ignorance is idleness, and an irrational desire for excitement; an ignorant man frequently does not sufficiently appreciate the value of time or of industry, largely because he is unable to adequately realise the future painful consequences of his conduct. A great deal of the time taken by the lower working classes in idleness under various excuses amounts to stealing from their employers' customers, *i.e.*, the public. Where there is ignorance there is usually indulgence of vicious pursuits in order to relieve the stagnation of the body; in the Spaniard this stagnation is relieved by the excitement of bull-fights; in the Irishman by faction-fights and family feuds transmitted from generation to generation; city roughs are relieved by street fights. The lowest class of working-men seek excitement in alcohol and in strikes. Ignorant persons are nearly always in want of excitement; and this is a great reason why the "Salvation Army scheme" and "Religious revivals" have been popular amongst them; a demand creates a supply, fanatical "shouters" are necessary to stimulate obtuse brains. Largely connected with ignorance is unreasonable dissatisfaction and quarrelsomeness; not distinguishing the difference between the natural ills of life, and those due to their own defects, ignorant persons are constantly wanting a cause of complaint, hence the phrase "another Irish grievance." It is often worse than useless to attempt to satisfy the unreasonable expectations of such persons, because it strengthens their idea that they have been wronged; the only effectual course is to remove their ignorance. "What can't be cured must be endured"; as long as moral training and intellectual improvement are neglected, so long will ignorance and its effects continue. "We have unduly neglected moral education in our schools" (Sir J. Lubbock, "Uses of Life," 1898, p. 11).

Ignorant persons are frequently envious, and nearly always lack knowledge of the true circumstances of those whom they envy; they envy and hate the intelligent, because the latter are more happy than themselves. The socialists and anarchists, for example, do not seem to adequately perceive that "he who is master of all is the servant of all," that the Queen is the servant of the entire nation; a nobleman is the servant of his dependents, for instance, he must find them employment; a great manufacturer is the servant of all his employees, and so on. Those who are in

higher positions are compelled in many ways to assist those who are in lower ones; the intelligent, industrious, healthy, and honest, are largely compelled to support in hospitals, asylums, and gaols, the ignorant, idle, diseased, and dishonest. Those who have knowledge are obliged to give some of it to those who are ignorant; scientific discoverers are the servants of all mankind, and have to give the whole of the products of their original researches to the public. Democracies have low morality (Crozier, "Civilisation and Progress," 1892, p. 347). And all this is in accordance with, and determined by the great scientific powers and laws which govern mankind. Ignorant persons often envy those who have money, but a poor man is none the poorer because another man is rich; an ignorant man is not more ignorant because another man possesses knowledge; an unhealthy man is not more unhealthy because another man has good health; but, on the contrary, the possession of money, knowledge, and good health enable a man better to employ and to help those who do not possess those advantages. Proper use of them justifies the largest possessions. If those who envy the upper classes could fully realise the responsibility, labour, and anxiety which the possession of wealth, property, and publicity usually entail, they would be less desirous of acquiring money and notoriety. Everyone who possesses wealth, land, property, or public reputation, must be continually prepared to defend it from the attacks of the envious, the unscrupulous, and the anarchical. Money invested is also constantly liable to be reduced in amount by failures of companies and of great undertakings, and by changes wrought during mere lapse of time. Moderate possessions yield the most happiness.

The very lowest class of labour, such as that of scavengers, miners, quarry-men, porters, farm-labourers, etc., is nearly always performed by the most ignorant persons. Ignorance largely disqualifies men from performing skilled labour; the south and west portions of Ireland supply a conspicuous example of this; there unskilled labour is cheap and skilled labour is dear (see "Industrial Resources of Ireland," by Sir R. Kane, pp. 401, 402). English capital may fail in Ireland, "unless the morals of the people, their taste for industrial pursuits, and their education, be promoted with the utmost zeal." "Why are our harbours and rivers idle; all progress in Ireland is due to Englishmen, whilst the population rests in the lowest grades? The fault is in ourselves, we do not know how to succeed" —"we want special industrial knowledge"—"England is far above us in such knowledge." An eminent Belgian statesman, M. Briarionne, asked, "What has produced the difference between the rich and flourishing condition of England, and the poverty and weakness of Ireland?—industrial knowledge" (*ibid.*, p. 411). "The education necessary for industrial pursuits is very generally underrated in this country." "Our ignorance is so great, that we are even incapable of estimating its extent. Without industrial education, any available development of our industrial resources must be almost impossible" (*ibid.*, pp. 412, 413, 424). The labouring population, aided by unscientific priestly influence, very nearly

prevented the recent establishment (1897) at Arklow of a large manufacturing enterprise. "Ireland was for more than a century the chief seat of linen manufacture, but the operatives so long resisted the introduction of machinery that other countries, especially Scotland, soon left her in the background" (Mulhall, "Progress of the World," 1880, p. 59). "There is no newspaper published in Irish" (*ibid.*, p. 92). Ireland is even now largely governed by theology, and is very deficient in industrial colleges and secular education (*Nature*, July 6, 1896, p. 237). Ireland is becoming re-peopled by other than Irish people. "Irish is virtually a dead language in commercial and manufacturing centres" (*Review of Reviews*, January, 1897, p. 58). Industry and fanaticism are deadly foes (Lecky, "Rise of Rationalism in Europe," 1890, p. 334). "Protestant nations are the most industrious" (*ibid.*, p. 338). Idleness and ignorance are closely associated, "birds of a feather flock together." The absence of scientific knowledge in any nation largely explains the influence of priestcraft, caste stagnation, and idleness. "Whether the Irish people do not care for having their children well taught, or whether those set over them are careless in the matter, the fact remains that the Irish people are ignorant compared with those of other countries. From the census returns of 1881 it appears that but fifty-nine per cent. of the people of Ireland are able to read and write." "Ireland is one of the few parts of the British Isles in which there seems to be little desire for a good system of elementary education." "The want of education has much to do with crime and outrage. If the statistics of crime and those of ignorance are carefully studied, it will be found that the most ignorant counties in Ireland are also the most criminal." "Ignorance and crime go hand in hand" ("The Irish Peasant," 1892, pp. 121, 126, 130, 132). Very little of natural philosophy and chemistry is taught in Ireland (see *Nature*, vol. lix, p. 189, December 22, 1898). The ignorant and idle are gradually ousted by the intelligent and active everywhere.

Ignorance generates suspicion; ignorant persons not being sufficiently acquainted with the complex nature of human conduct, its numerous and deep-seated causes, are more apt than intelligent ones to attribute bad motives to other persons; they are often suspicious of knowledge, because they are unable to understand it. They are also frequently crafty and hypocritical, being deficient in sound principles, and experiencing the difficulties of actual life, they are obliged to resort to undue reticence, craft, and deceit, in order to effect their objects, and as a means of protection and defence. Women are frequently more artful than men, because they usually possess less knowledge. Craftiness is a base kind of cleverness, without fundamental knowledge or good moral rules to guide it; and when it is combined with persuasive language and demeanour, it is a very dangerous quality. A crafty man is evasive and usually secretive, and whilst artfully withholding from another man the knowledge to which he is entitled, endeavours to impress upon him fallacy as truth; but, in the long run, ignorant craftiness is nearly always defeated by superior intelligence.

Reticent persons are frequently artful and fail to inspire confidence in experienced persons.

There are various other symptoms of ignorance, and amongst them are —indecision and fear of the natural risks of life. By paralysing the will through deficiency of sound ideas, ignorance causes indecision and want of promptitude, or else it makes men reckless from sheer desperation; without suitable knowledge a man cannot act safely or promptly. Ignorant persons not having learned the necessary conditions of existence, are frequently anxious respecting their probable degree of success in life; they are alarmed as to where knowledge would lead them, as if darkness was a better guide than light, or truth could ever lead to wrong.

Ignorance exaggerates popular ideas of all kinds; the followers of any popular leader or of the founder of any sect, excessively extol the object of their veneration; a number of exaggerations are constantly being repeated by Buddhists, Moslems, and Christians, for the purpose of supporting their respective theological systems. It is well-known to biblical critics that many of the most excellent ideas which are credited to Christ were known to the Chaldeans and others, hundreds of years before the time of His birth (see "History of the Warfare between Science and Theology," vol. ii, A. D. White, 1896). Probably nothing hinders the adoption by careful persons of that which really has some good in it, than exaggerated advocacy of it by injudicious ones; the virtues of Christ and Christianity have been largely depreciated in this way.

Ignorant activity is perilous and sometimes criminal; the ideas of anarchists, revolutionists, and others, are often dangerous. One socialist writer proposes to improve the condition of the "labouring classes" by "nationalisation of the land and all other instruments of production and distribution," to "make all the land, mills, mines, manufactories, works, shops, ships, and railways the property of the people," and states that "there will be no difficulty about the plans"! (R. Blatchford, "Merrie England," pp. 43, 109, 198). Throughout the book, however, the author almost entirely omits to make any reference to the great energies and laws of science and rules of conduct which govern the universe and mankind, and which control the whole of his project. He does not seem to think it necessary to consider them, and the most charitable explanation of this is that he is ignorant of their irresistible influence in preventing the carrying out of his scheme. His book is practically a promise of a very easily obtainable millennium, without proposing a reasonable means of securing it. The popularity of his ideas is illustrated by the circumstance that "700,000 copies" of his book are said to have been sold.

Socialists generally, and the socialist workman at Lyons who concluded his address by saying:—"Let us remember that we are so numerous that nothing can resist us," do not appear even to suspect that mankind are moved by omnipotent energy acting in accordance with immutable laws, and that they themselves are moulded and guided by invisible powers "like clay in the hands of the potter." Many socialists assert that "rent

is robbery," that profit is immoral, that "labour is an evil to be minimised to the utmost, the man who works at his trade or avocation more than necessity compels him, or who accumulates more than he can enjoy, is not a hero, but a fool"; as if a man ought not to work for the good of others. "Father Benson says:—'If a man can have no crime imputed to him save this—that he has accumulated riches in the bank; that alone is sin enough to send him to hell'" (G. Brooks, "Industry and Property," 1895, p. 255); as if money in a bank was not being used for the good of the community, to pay wages, etc. According to the same author, "Mr. John Burns (a leader and adviser of working-men) said that 'thrift was invented by capitalist rogues to deprive honest fools of their diet and proper standard of comfort'" (*ibid.*, p. 272). These statements are, however, contradicted by the facts that industry is necessary to health, that thrift is a duty, that "just laws do not exclude unequal fortunes"; that by the accumulation of wisdom, knowledge, wealth, energy, etc., much greater good can often be done than by pursuing the opposite course; if employers had not capital they could not find poor men employment, wages, etc.

The following illustrates the effect of ignorance upon socialistic leaders. Mr. Belfort Bax in his "Religion of Socialism," addressing an imaginary railway company, says:—"Business is business, let us have no sentimentality. We are on a footing of competition, only that it is not 'free,' seeing you have got the law on your side. However, let that bide. Your 'business' is to get as much money-value out of me, the passenger on your line, and to give as little as possible in return, only, in fact, so much as will make your line pay. My 'business,' as an individual passenger, on the contrary, is to get as much *use* value, to derive as much advantage from the social function which you casually perform in pursuance of your profit, as I possibly can, and to give you as little as possible in return. You seek, under the protection of law, to guard yourself from 'fraud' as you term it. Good. If I can evade the law passed in your interest, and elude your vigilance, I have a perfect right to do so, and my success in doing so will be the reward of my ingenuity. If I fail I am only an unfortunate man. The talk of 'dishonesty' or 'dishonour,' where no moral obligation or 'duty' can possibly exist, is absurd. You choose to make certain arbitrary rules to regulate the commercial game. I decline to pledge myself to be bound by them, and in so doing I am clearly within my moral right. We each try to get as much out of the other as we can, you in your way, I in mine. Only, I repeat, you are backed by the law, I am not. That is all the difference." It is a great mistake of this writer to say that there is "no moral obligation or duty" in the matter, and that he is clearly within his "moral right" to defraud the railway company. He does not seem to know that one of the most important and imperative of moral rules is "to do unto others as you would have them do unto you under like circumstances," and it is probable that if he was largely defrauded by a railway company, or by anyone else, he would greatly complain. A man who defrauds another unwittingly is a fool, but he who does

it wilfully is a rogue. If the exponents of socialism are so ignorant of the first and simplest rule of morality, how much more so must be the less intelligent masses who are led by them? It is not moral to defraud another person, even if that person has already defrauded us; nor may we forcibly take from another even if we have already given to him; the moral rule, that "we may give, but not wrongfully take," is a very sound one.

As an illustration of the spread of ignorant socialist ideas I may perhaps be permitted to mention the following:—One morning I was walking near Bakewell in Derbyshire, and a boy about fourteen years old, looking like a town's boy not badly clothed, begged some money of me, and I said to him "What, are you a beggar at your age?" He replied at once, "I ain't a beggar, the money you've got in your pocket is as much mine as 'tis your'n, you didn't work for it; you've got more money in your pocket than you knows what to do with, and if my body was on the ground you'd walk over it." "Oh, indeed," I said, "you are not only a beggar but a liar also."

Some of the doctrines and practices of socialistic trade unionists are so highly opposed to the laws of science and the rules of morality that if it was not for their seriously evil effects they would be unworthy of notice. Recent strikes of workmen have been largely due to socialistic ideas; "it is computed that over two thousand strikes occurred in Great Britain in the year 1889" (G. Brooks, "Industry and Property," 1895, p. 23); and it has been estimated that the direct and indirect losses by the engineering strikes and lock-outs during the year 1897 amounted to "not less than fifteen million pounds sterling"; and that of the miners in South Wales during 1898 was "seven millions." These retarding effects upon English civilisation and progress have been largely due to the unscientific ideas of socialists and of the least intelligent of English workmen.

Socialism, and to some extent trade unionism, is a system by means of which the ignorant and idle attempt to live upon the labour and knowledge of the industrious and intelligent. The following is an instance:—"I say there is no need for any struggle for existence" (R. Blatchford, "Merrie England," p. 19); such a statement as this could only be made through ignorance of the subject, or knowingly for a purpose, because the struggle for existence exists throughout all animated Nature both vegetable and animal, and is an absolute necessity, a consequence of omnipotent energy and immutable law. Further, "I would have all our children fed and clothed and educated at the cost of the State" (*ibid.*, p. 44); but who is to pay for this? as life is a condition necessarily involving labour, trial, and pain to every man, it follows that this proposal is an extension of the poor-law system, by which the incapable, the unfortunate, and the idle, live upon the labour and knowledge of the capable and industrious, viz., the ratepayers.

"Masses of men are thoroughly under the delusion that they can, by the mere fact of organising themselves into a union, reverse the laws of Nature, change the very constitution of things, successfully defy Omnipo-

tence and outwit Omniscience" (G. Brooks, "Industry and Property," 1895, p. 274). If, however, working-men are able to turn the results of a general election by mere number of votes, they cannot turn aside natural energy and laws; it is useless for any class of men to raise a standing army to fight against Nature, the mere attempt is a proof of great ignorance. "Audacity, audacity, audacity," which was the advice of one of the most conspicuous of trade unionist leaders during the great and unsuccessful strike of 1897 is of no avail against great natural powers. No circumstance perhaps better illustrates the fallacy of such ideas than the repeated failures of the opposition of workmen to the introduction of machinery, the use of which usually inflicts hardships upon them and upon their employers; notwithstanding the riots at Nottingham in 1811 and 1812 lace-making by means of machinery became firmly established there. As the introduction of new machines, inventions, processes, or methods, often displaces and turns into other channels manual labour, skill, and attention, and compels men to seek new sources of employment and livelihood, it is not surprising that the lower class of workmen are often suspicious of and opposed to such innovations, however advantageous they are likely to be to mankind or to themselves in the future; they feel that—"You take my life when you do take the means by which I live." The energy of Nature, however, is no respecter of persons; all men are required to prepare for what may happen to them; it is one of the trials both of masters and men to have to adapt themselves to new machines, methods, and processes, and to change their occupations as civilisation advances; the English nation has already to some extent changed from agriculture to manufactures, and from manufactures to money-lending. With nearly all persons who have to earn their living, success in life depends very largely upon their sacrificing the present to the future; and he who does not work for the future the future will heavily punish; it is a duty of every man to store up knowledge, as well as money for future emergencies. The less intelligent a man is, the smaller is his power of tracing consequences, of seeing ahead, and of predicting events; hence he is unthrifty and careless about the future. Ignorant persons are unwilling and poor ones are unable to wait for the results of their labours, and multitudes of them through lack of thrift "live from hand to mouth" in every possible way. Every person must have either property or credit upon which to live until he can obtain the reward of his labours; for instance, the farmer must possess means of living whilst his crops are growing. Ignorance resists improvements everywhere; "the introduction of potatoes into Russia in the year 1769 was attended by fearful riots, the Russians saying they were 'devil's apples'" (Mulhall, "Progress of the World," 1880, p. 373); nevertheless, potatoes have been of great value to them.

There is scarcely anything which selfish ignorant men will not believe or do if they think that they can gain by it. The lazy and thriftless want "a fixed minimum wage," fewer hours of work, and when they become old and infirm, to be fed and supported by their more careful and

industrious fellow-men. At the present time, according to Sir R. Giffen, the working-man receives 50 per cent. higher wages, for doing 20 per cent. less work than he formerly did. Discoveries and inventions have benefited workmen as much or even more than any other class of persons, the so-called "unearned increment" also of landowners and investors, if it is properly used, benefits all persons; and skilled artizans have been very great gainers in many ways by the progress and increased wealth of the country; it is easily proved that the means of living increase much faster than the population. Our manufacturers and workmen will however probably have to suffer great changes by the spread of knowledge in other countries, and the consequent increase of foreign competition, and their only safe course is to "look ahead" and prepare themselves for events.

Socialism is largely one form of the ancient and almost universally practised doctrine of "taking." A multitude of persons in nearly every walk of life appropriate as far as they are able the mental and material products of other men's labours, and the only limit to this practice in many cases appears to be the power of the possessors by legal and other means to prevent it. The variety of ways in which this doctrine is practically carried out are so many that it is beyond the scope of this book even to enumerate them. The practice extends from that of the beggar who threatens that if you do not give him money he will break your windows, to that of the wealthy possessor of shooting-grounds or other landed property, who "annexes" "rights-of-way," and pieces of common ground, in out-of-the-way districts, and that of governments who forcibly take possession of distant lands. Some persons, blind to the great truth that when they unjustifiably injure another they indirectly injure themselves, would probably entirely appropriate the atmospheric air, the water of the ocean, and the light of the sun, if they could. In some countries the gospel of taking is practised so generally that nearly the whole of the population practically live by robbery (the wandering tribes of Bedouins in Arabia are an example), and no one can safely travel there but those who are extremely poor and possess nothing to be taken, and those who are sufficiently rich to pay for an armed escort, or to give unlimited "backsheesh." A very usual method of appropriation in civilised countries is by shifting a burthen or loss from one man's shoulders to those of another, as occurs in many instances where private businesses in a declining state are converted into limited companies, and sold at a price altogether beyond their value. "Everyone does what he thinks he may do without punishment; shirks, takes advantage of, deceives and makes use of others as well as he can, with the conviction that no one would treat him any better. In general they regard anyone who does not take this course as too stupid and silly to be able to follow it" (Burmeister's "Remarks on the Brazilians"; Dr. L. Büchner, "Man in the Past, Present, and Future," 1872, p. 350). It has been estimated that the average "takings" for himself of each of the conductors of the London General Omnibus Company, previous to the adoption of the

registering ticket system, was quite two shillings a day (J. Greenwood, "Seven Curses of London," pp. 146, 147). "The whole system of commerce and finance is rotten to the core; statesmen must rob, lawyers must lie, parsons must compromise, merchants and traders must cheat if they expect to live, and so on" (Lawrence Oliphant, "Scientific Religion").

In many instances of valuable processes which have cost their proprietors large sums of money to perfect and patent, the patent is systematically attacked, and if there happens to be a legally technical defect in the wording of the patent, such as "disconformity" of description, the patent is annulled and the process thrown open to the public; the valuable cyanide process for extraction of gold from its ores was attacked and taken in this way. Manufacturers not unfrequently develop, at more or less cost to themselves, improvements valuable in a pecuniary sense in their processes; employés take the new knowledge to other manufacturers and the latter use it.

Another mode of helping one's self to other persons' rights, is by taking privileges without proper permission; thus cyclists take the liberty of travelling at reckless speed, and endanger the lives of pedestrians, or they take improper advantage of using the footpaths. Multitudes of servants habitually use their employers' time for their own purposes. Not a few persons with third-class tickets take every opportunity of riding in higher class carriages, to the annoyance of those who have paid the proper fare in order to avoid their society. Stokers of fires in manufactories, in order to save themselves labour, neglect to properly stoke their fires, and thus fill all the neighbouring dwellings with smoke, and damage the property and the health of the surrounding inhabitants, and put the ratepayers to the expense of "inspectors of nuisances." A multitude of other cases might be mentioned, but these are sufficient, and it practically comes to this, that if any person is known to possess anything of value, some untrained or unprincipled person devises some means for taking it from him or of encroaching upon his rights. These and other instances are largely a consequence of children being brought up in ignorance of the chief rules of morality.

The subject of ignorance is of great importance to all classes of society, and next to the casual labourer probably to none more than to the English mechanic, because his greatest opportunity of increasing his happiness and improving his position in life depends upon his becoming intelligent himself, and being free from the tyranny of ignorant leaders and trades union officials. Trade unionism is largely slavery to officialdom. Trade unions largely suppress freedom of contract, they prevent employers engaging suitable workmen, by compelling them to hire any incompetent man whom a trades union official chooses to send him; and they prevent competent workmen obtaining employment unless they first join the trades union society. Trade unions and socialism tend to reduce all men to the same dead level of ability; instead of inducing the more ignorant

and incompetent workmen to improve themselves, they depress the intelligent and industrious by compelling them to do their work slowly and badly, and by compelling employers to pay inferior workmen at the same rate as better ones. The general effects of them appear to be to make everything as expensive as possible to the consumers or customers, including themselves; and to enable other nations to supersede us in manufactures. According to a recent author (J. S. Ransome on "Modern Labour"): "It is difficult to appreciate the extent of harm effected by these institutions" (*i.e.*, trade unions) "supported by blackmail, and held together by terrorism" (*ibid.*, p. 35). "There was a time when it was considered probable that if a man belonged to a trade society, he would at all events be an average workman. Such, however, is no longer the case. Many of the unions will take in any man who is good for a subscription. It is a question with them of funds at any price—of quantity at the expense of quality. Such being the case, the only possible result is that the trade societies are at the present day lowering the standard of British workmanship (*ibid.*, pp. 16, 33). "The attitude of the union leaders with regard to piece-work is that of discouragement of it by fair means and foul."—"Their reason for objecting to it is that it gives to the good men a chance of coming to the front, of which they rapidly avail themselves, and this is dead against union morals. A good man must hide his efficiency under a bushel, and lower his standard to the necessary mediocrity, and work the 'trade union stroke' or he will be a marked man'" (*ibid.*, p. 63). "The efficiency of non-unionists, as workmen, is, as a rule, of a far higher standard than that of the members of trade societies" (*ibid.*, p. 118). Trade unionism has largely encouraged laziness, "time-stealing" and "labour-thieves." "All the most stupid, lazy, and thriftless men in the country are of necessity members of the trades union, because they have a protection which could not otherwise be theirs" (*Engineering*, October 19, 1897, p. 536).

The intolerance of the ignorant in any subject is directly proportioned to their power, and the despotism of ignorant men is far more intolerable than that of intelligent ones. The more ignorant a man is the more cruelly does he tyrannise over his fellow-men, and we have only to remember the numberless cases of very cruel conduct of workmen on strike towards each other; the brutal outrages, the atrocities and intimidations practised by the ignorant peasantry of the Land League in the south-west part of Ireland; and the cruelties practised by the King of Dahomey on his helpless subjects, as illustrations of this statement. One of the methods of intimidation adopted by trade unionists towards non-unionists "is to write a letter to a man's wife condoling with her on the fact that she is about to become a widow, it having come to the knowledge of the writer—anonymous, of course—that it has been decided at a secret meeting of 'The Friends of Labour' to put the husband out of the way" (*ibid.*, p. 520). Ignorant workmen are often prone to violence and more ready to resort to force than to reason for the purpose of settling disputes and

remedying their "wrongs," and are fond of talking of "war to the bitter end," and of winning "with hands down" in labour disputes, as if there existed no scientific laws or moral rules to assist them in such cases; and it is more frequently the young men with less knowledge and experience than the old ones who advocate forcible methods. Socialistic trade unionism is a menace and a danger to the public in general; why should an irresponsible labour "leader" be allowed to intimidate the public and paralyse the trade of the country by threatening to "call out 200,000 workmen"? in such a case the public would have to be consulted in the matter. That intelligence requires protection from ignorance, and uneducated persons from themselves, is shown by the necessity and utility of the Federation of Employers against the ignorance and malpractices of trade unionists and socialists.

In many of the "strikes" of work-people, neither trade unionists nor their leaders appear to know or even to suspect that there are omnipotent natural powers which influence all their actions, disturb all their schemes, and ultimately cause most of them to fail and punish the workmen severely; but the workmen and their leaders go blindly on as if they could, by mere "audacity," overcome everything. Mankind, however, are not essentially guided either by employers, workmen, or their leaders, nor even by governments, popes, or emperors, but by unseen omnipotent energy acting in accordance with unchangeable laws, and not only trade union societies, but even nations are mere puppets moved by its influence. It is entirely unscientific and ridiculous to suppose that conferences of men and their masters can "conciliate" relentless natural energy, or successfully "arbitrate" in opposition to immutable laws, the only course in all cases is to submit to and obey them; to expect those irresistible powers to submit to mere men except by men first obeying them is quite as irrational as to expect the sun to stand still in the heavens or the earth to leap out of its orbit, and those who think that they can permanently succeed in "strikes" by mere "British pluck," or "audacity," must have very conceited opinions of their own power and cleverness. It is useless to decide that all men shall work eight or ten hours a day, but accept that which is necessary in the particular case; such a decision would be nearly as futile as to resolve that the sun shall shine longer in winter and shorter in summer in order to make the day equally long and the earth equally warm for the trade unionist workmen all the year round; why should the trade unionist be favoured more than the remainder of mankind? The socialistic trade union plan of trying to compel the whole of the men in a given occupation to perform the same quality and quantity of work per day is equally irrational, because no two men are alike and no amount of compulsion can make them so. Ignorance and error are most powerful causes of national decay, and neither workmen, conferences, nor nations can make great mistakes with impunity; the only road to success is obedience to natural laws. Other persons, and other nations, can see it, but the ordinary trade unionist and his leaders, either cannot or will not,

that the character of this nation for industry and honesty is being injured by trade unionist practices. "One of the most discreditable indications of a low moral condition given of late by part of the English working classes is the opposition to piece-work" (J. S. Mill). "All a union does is to strike against low wages; they never strike against bad work" (G. J. Holyoake). The statement that "It does not matter to them whether an employer's business pays or not; it is their business to get as much in the shape of wages and to work as few hours as possible" (John Burns) is largely incorrect, and is a very discreditable one, because it encourages "time-stealing"; if also the employer's business does not pay he cannot employ workmen.

Misdirected trade unionism injures everybody for the temporary and irrational gain of a few, *i.e.*, it injures all the buyers of a particular article by raising its price, for the pecuniary advantage of the comparatively few workmen who make it, until a reaction occurs and the customers either refuse to buy or they purchase it elsewhere. One writer says: "I know of no trade union which does not violate the first principles of economic science, and of human liberty" (J. Birks, "Trade Unionism in Relation to Wages," 1897, p. 7). "Every contribution to the funds of a trade union is, of course, a substantial reduction in wages. Every such contribution; every levy to support a strike; every strike riot; every case in which capital is destroyed or repelled; every strike engaged in, whether directed against an employer or against a foreman who won't join the union; every strike against non-union labour; every strike of one trade against another, or against machinery, like the one in the shoe-trade; every one of our annual 700 or 800 strikes; every man you throw out of work, or force into the unskilled trades; every injury to the reputation of a firm caused by frequent strikes; every piece of silly legislative meddling bought by a solid trade unionist vote; every attempt to prevent the strong man doing an honest day's work; every attempt to lessen production, or to increase the cost of it; every attempt to make the worker rich by making the world poorer; has a direct, a positive tendency towards a reduction of wages" (*ibid.*, p. 16). It is a serious matter to diminish national industry and interfere with the law of supply and demand by means of strikes and lock-outs, because it is disobedient to the wider principle of action and reaction upon which national welfare is based; and is accordingly punished by driving away customers, and with them the money with which wages are paid. The trade unionist's idea that the price of labour is not chiefly determined by its value is most erroneous; and will bring about its own punishment.

And with regard to the wisdom of working-men's contributions to trade union societies:—"If men choose to invest their money in securities the shares of which are never at a premium, never even at par, and which could never be sold even at 90 per cent. discount; if they care to invest in societies which pay no regular dividends, and rarely any at all, except when they throw their members out of work, or when the latter strike as the

only means of getting a little of their money back again; if they care for societies which have legal rights without legal responsibilities—for societies whose contributions are compulsory, but whose benefits are generally doubtful, and always optional, and upon whose funds, even when there are any, members have no legal claim; if they care for a life policy on which it would be impossible to borrow five shillings—a policy which has no surrender value, which gives no bonus, and which they dare not lapse—a policy which does not even promise to pay a tenth part of what the premium would command elsewhere, and which in thousands of cases pays nothing at all; if men will barter their earnings and their liberties for securities which Sydney Webb confesses every severe depression sweeps away by thousands into oblivion—in securities which they can neither sell, nor bequeath, nor mortgage, nor lend, nor give away, and which they dare not even lose, I say, if they will do this, it is a matter which concerns only themselves" (*ibid.*, p. 5); it is, however, a mistake to say that such conduct "concerns only themselves," because a man cannot either benefit or injure himself without also benefiting or injuring others, and especially those most nearly related to him, and the nation of which he is an individual. The whole of the foregoing mistakes of British workmen are more or less due to lack of knowledge of the chief rules of morality, and of the scientific principles upon which they are founded.

Competition promotes industry, but socialism and day-work discourage it. As an example of the better influence of piece-work than of day-work upon operatives; "a special experiment," to test a socialistic idea of the late Louis Blanc, "was tried at the Hotel Clichy in Paris with a Government order for the uniforms of the National Guard. Fifteen hundred tailors were assembled, and were allowed two francs a day as subsistence-money while they worked, and the balance between the sum paid, and what the work would have cost had it been executed by an army contractor, was to have been equally divided among them afterwards. It was found, however, when the day of reckoning came, that not only was there no balance to be paid, but that there was an actual loss, and that the two francs a day of subsistence-money, the lowest rate of wages paid to tailors under the competitive system, had overpaid them for the work actually done. Their energies, unexcited by the spirit of competition, relaxed when each man found that the proceeds of his increased exertions were not to be received by himself alone, but had to be distributed over the whole of his fellow-workmen; and even the thought of 'liberty, equality, and fraternity,' was insufficient to incite them" (Beeton's "Dictionary of Science," vol. i, p. 558). Similar to the proper price of any article or service, the proper "minimum wage" is not any fixed amount, but that which can be obtained by just means in open competition, so that there can be no real fixed minimum wage. There is plenty of scope for working-men to rise as thousands of other persons do, viz., by means of self-improvement and ability, instead of wasting their energy in trying to obtain something for nothing. A proper day's work is usually the maximum which a man can

perform without injury to his health, and the most correct way to obtain higher wages is to do better work or more of it.

Trade unionism has become highly socialistic; and the characteristics of socialism are largely ignorance, envy, and covetousness. It is easy to perceive that socialism, into which trade unionism merges, and communism and anarchism, into which socialism glides, are largely opposed to public welfare and human progress. Nearly all the experiments which have been made in them at different times and in different countries have been more or less failures, and the failures have been usually due to the circumstances that no two men are exactly alike, that their differences are often irreconcilable and prevent them living closely together, and that the industrious members of a community have been unwilling to support the idle ones. It is either personal want or desire which produces industry; few persons are willing to work unless they are compelled by one of these stimulants; nor unless they are either allowed to choose for themselves the kind and amount of employment, or be paid in proportion to their skill and industry. "The man without wants is hostile to all improvements of civilised life. Only when wants are awakened in him, and he is accustomed to work for their satisfaction, does he form a promising object for social civilising efforts" (Werner Von Siemens).

Trade unionism and socialism are highly destructive of talent, ability, and progress. According to some socialist writers, a man who labours with his brain does not work or deserve payment, but only he who employs his bodily strength; according to them, the man who makes great sacrifices to improve himself, and who disciplines and uses his nobler faculties, is not entitled to be paid for his labours! Wealth and comforts in a community, however, are often much more due to intellectual than to bodily labour; the latter can in many cases be deputed to inanimate machines to perform it, but the former cannot. It is much more pleasant to be levelled up in personal conceit than to be levelled down. The socialist tendency to treat all men as being equal is very flattering to uneducated and poor men, who have not acquired knowledge, or trained themselves in habits of thrift and economy; but it does not agree with the great truth that amongst the twelve hundred million human beings who inhabit this earth, no two are exactly alike. If all men are equal, then it necessarily follows that robbers and murderers are on an equality with socialists. It is quite true that all men are equally determined by causes; that they are equal in subjects they equally understand, and largely so in great emergencies; but it is vain for any one who possesses neither knowledge, wealth, social position, nor conspicuous ability, to practically say to those who have those possessions, "I am as good as you"; it is much like the fable of the frog trying to swell himself to the size of the bull until unfortunately he burst.

> "Order is Heaven's first law; and this confest,
> Some are, and must be, greater than the rest,

> More rich, more wise; but who infers from hence
> That such are happier, shocks all common sense."
> —*Pope.*

> "For some must follow and some command,
> Though all are made of clay."
> —*Longfellow.*

Individual possession of property is necessary to progress, and if an individual may not possess land or property neither may a nation of socialists. Credit is built upon possession of property, *i.e.*, of money or of available money value. Property and capital should be secure, and labour should be free. Property is the product, not of bodily labour alone, nor of machine labour alone, but largely also of brain energy, with the aid of capital. Without intelligence, experience, and money, agricultural labourers could not stock farms, nor wait for the crops to grow; miners could not pay for sinking shafts nor for mining appliances; spinners could not build cotton or woollen factories, nor purchase machinery; dockers could not construct docks, nor sailors build ships; planers, turners, and fitters of machinery, could not erect or pay for engineering works nor for the machinery in them, nor in any case could persons without capital give credit for the articles supplied or wait for the proper period of payment. Much knowledge, intellect, pecuniary responsibility, experience, and administrative ability, is usually required in all these cases, in purchasing, supervising, contracting, watching the markets, cost of conveyance, and a multitude of other intellectual operations, of which the ordinary workman is very largely ignorant. The difficulties of an employer are far more numerous than those of a workman, and require much more intellect and variety of ability to surmount them. The equal distribution of money, property, and ruling power, is a scientific impossibility. If the idle man wishes to share equally with the industrious one the good things of this life, he must first earn them, if the poor or unintelligent one wishes to rule, he must first acquire suitable knowledge, experience, and sufficiency of capital.

Many of those who exhort masters and workmen to agree and live together without conflict, recommend them to do what they themselves are often unable to do, and seem to forget that trained and untrained men, and those who differ largely in knowledge of any subject in dispute, never did agree, and never can. Only persons of similar tastes, knowledge, language, and occupations, can usually live together in peace as a communistic body, and even they only as far as their personal interests do not clash. Just like the white man in the Slave States of America finds it impossible to live under the rule of the black man (see "Black America" 1891, p. 8, by W. L. Clowes), so is it impossible for employers to submit to be ruled by those they pay and employ. It is not the duty of employers to defraud the public by adopting the narrow-minded doctrines of their workmen; but it is the duty of the latter to educate themselves in social and moral rules. There is a limit to the extent to which those who possess

more knowledge or more money are able to give, or ought to give, to those who possess less, and especially to those who neglect themselves, who are continually clamouring for "more"; and often dishonestly taking it; poverty is usually due to personal defects rather than to those of society. Greedy men are always wanting and always miserable.

Deficiency of knowledge is the source of many other evil effects. Ignorance of nations, arising from difficulties of intercommunication, has, until recently, been a large cause of war, of international hatred, of unjust conquests, and of international disputes; wars would probably, in many cases never have been encouraged had we known that other European nations were composed of men as worthy and honourable as ourselves. It is not very long since ordinary Frenchmen and Englishmen considered each other their natural enemies. In consequence of being separated by distance and natural boundaries, the social feelings between nations are the least developed; men in general undervalue cosmopolitanism, and overvalue patriotism, they entertain too freely the narrow idea of "our country against the world"; and this tendency, together with ignorance of each other's language, has hindered international friendship, and led to many wars. Patriotism is often national prejudice. Scientific knowledge, however, by producing the telegraph and facilitating intercourse between nations by means of railways and steamships, has largely diminished the risk of national conflicts.

Whilst knowledge is a source of happiness, power, and progress, "ignorance is the mother of faith, devotion, and piety"; knowledge encourages truth, and ignorance supports blind belief. It is easy to perceive that as blind belief is closely allied to ignorance, and ignorance is intimately associated with immorality, that the least intelligent forms of "religion" are often associated with "evil." "In all countries superstition is closely related to crime." "Among two hundred Italian murderers Ferri did not find one who was irreligious." "A Russian peasant may be a highway robber or a murderer, but he continues, nevertheless, to cross himself and say his prayers." "Dostoieffsky also notes the religious ardour with which the convicts gave candles and gifts to the Church." "All those who live by unlawful methods, said Casanova, confide in the help of God" (H. Ellis, "The Criminal," p. 156); many other illustrations are given. "Criminal communities have their priests." It is well-known that revolting criminal conduct is closely associated with religious devotion amongst the ignorant portion of the black population of the Southern States of America, and greatly excites the resentment of the white portion of the inhabitants. It is largely in consequence of the ignorant notion that particular theological beliefs are more important than moral conduct, that untruthfulness has always been largely associated with a profession of religion. Originally, religion "had no sort of connection with moral character at all. It meant simply a system of rites and ceremonies by which the gods were to be influenced, by which their wrath was to be warded off, by which their favour was to be won" (M. J. Savage, "The Morals of

Evolution," 1887, p. 27). Those persons who are so irrational as to believe that "nothing equals in value a single soul," are precisely the same class as those who burned "heretics" in order to save their "souls." It is as dangerous to mankind to trust in blind faith without comprehensive knowledge, as to trust their lives in a ship without a rudder. As faith alone gives us no real knowledge, it does not advance civilisation. Whilst faith in real knowledge levels men up, faith in unprovable dogmas levels them down.

That blind faith and credulity lead to crime, sometimes in a very direct manner, is shown by the following recent case of so-called "supernatural" vision. "November 4, 1895." "The *New York World* publishes a dispatch from Taxacapa, in Mexico, that ten heretics have been burned there by order of the local judge. The judge, by whose order ten persons were burned as heretics, claims that he was acting according to the will of God, manifested in a vision (!!). As soon as the news reached Mollango, the principal town in the district, the municipal president and minor officials, with an escort of sixty men armed with rifles, proceeded to Taxacapa, where they found everybody in the public square executing grotesque dances round the ruins of the gaol in honour of the Virgin Gaudalupe. The judge related the details of his action with great *sang-froid*, and said that he was unaware of having done any wrong. He claimed that God had wrought miracles to confirm what a saint had told him in a vision, and had ordered him to execute the heretics. 'I obeyed the divine command,' he continued, 'and ordered out the constables. They took the sinners from their beds, and dragged them, weeping and wailing, to gaol. They were locked in securely, and I gave orders that the constables should set the building on fire. The heretics were filled with fear and shouted for mercy; but Heaven's will had to be done, and they were consumed to the bones, and the vengeance of Heaven was averted from our community.' Twenty-one arrests were made in connection with the affair, and although the fanatic mob threatened death to the authorities, the prisoners were securely bound and marched to Mollango, where a judicial investigation was held. The entire population of Taxacapa appear to be under the influence of an unreasoning and insane excitement, for all the inhabitants believe that the local judge was commissioned by the Almighty and the saints to destroy evil-doers. In support of this contention they point to the pile of bones on which they profess to see the forms of saints miraculously traced in outline.—REUTER." These atrocities are manifestly direct results of ignorant belief in "supernatural" visions, and illustrate the criminality of such beliefs.

Another recent case is one of witch-burning at Clonmel in Ireland, where the superstitious believers in witchcraft were sentenced as follows:—Michael Cleary, 20 years penal servitude; Patrick Kennedy, 5 years; John Dunne, 3 years ditto; and the four other prisoners to smaller punishments (*The Times*, July 6, 1895). In Ireland also, Patrick Cunningham, jun., and John Cunningham were found guilty of manslaughter, and were ordered

to be confined in a lunatic asylum, they having murdered James Cunningham "under the belief that he was possessed by evil spirits" (*The Birmingham Daily Post*, July 11, 1896). According to John Wesley, the founder of the sect of Methodists; "unless witchcraft is true nothing in the Bible is true" (A. D. White, "The Warfare of Science and Theology," vol. i, p. 148). The efficacy of exorcism in the casting out of evil spirits is still believed in by the head of the Catholic Church (see p. 156).

Ignorance is frequently cheap and pleasant at the outset, but very dear and painful in the end, because it sooner or later results in accidents, explosions, law-suits, family quarrels, doctor's bills, undertaker's charges, shipwrecks, wars, etc. Ignorance of sanitary matters results sooner or later in fevers and epidemics, importation of cholera, etc. Cheaply built houses, bridges, railways, ships, steam boilers; cheap furniture, clothing, food, religion, etc., are all of them dear in the long run. When one man or section of mankind is ignorant, all have to suffer, by having to pay for prisons, workhouses, hospitals, lunatic asylums, police, sanitary inspectors, soldiers, etc. That which we cannot cure we have to endure, but provided the burden is not too great the act of endurance develops and strengthens our best qualities.

Ignorance may be regarded as a mental disease, which may afflict an individual, a family, or a nation. "Not so very long ago, the attention of an American physician, Dr. Harris, who was greatly interested in social questions, was called to a county on the Upper Hudson, where there appeared a remarkably high proportion of crime and poverty to the whole population. The county contained but one town and only a few small villages. It had a population of some four thousand; yet the number of paupers in its almshouses was four hundred and eighty, or about one in ten, not reckoning a considerable number assisted by outdoor relief.

"Investigation showed that certain names were repeated again and again in the criminal and poorhouse records of the county, and Dr. Harris was thereupon led to follow up the histories of certain families. Ordinarily this is an extremely difficult task. In cities, criminal families become broken up, and their members scattered. In villages, though their lines of descent may be followed, yet the retributive laws of Providence usually carry the effects of crime only to the third or fourth generation, and then the race comes to an end through physical and moral degeneration, the final members being commonly idiots, imbeciles, lunatics, or in some countries *crétins*. It happened, however, that in this county the physical vigour of the families traced had been exceptional, and had preserved some of their members for their evil destiny, thus enabling the investigator to trace them back *for six generations* of wickedness and misery.

"Many years ago a young girl named Margaret was left adrift in one of these villages—it does not appear whether through the crime or misfortune of others. There was no almshouse in the place, but Margaret became the subject of outdoor relief, probably receiving occasional food and clothing from the officials, but never educated and never kindly sheltered in a home.

She became the mother of a long race of criminals and paupers, and her progeny has cursed the county ever since. The county records show *two hundred* of her descendants who have become criminals.

"In one single generation of her unhappy line there were twenty children; of these, three died in infancy, and seventeen survived to maturity. Of the seventeen, nine served in the State prisons for high crimes an aggregate term of fifty years, while the others were frequent inmates of gaols and penitentiaries and almshouses. *Nine hundred descendants* were traced through six generations of this unhappy girl who had been in her childhood left on the village streets and abandoned. Of these a great number have been idiots, imbeciles, drunkards, lunatics, paupers, and abandoned in their lives; and, as already said, two hundred of the more vigorous are on record as criminals.

"This neglected little child has thus cost the county authorities, in the effects she has transmitted, many thousands of pounds for the punishment and maintenance of criminals and paupers, to say nothing of the untold damage her descendants have inflicted on property and public morals. Certainly she has cost the community more than the greatest criminal in her day and generation! When we think of the multitude of wretched beings this one child, after six generations, has left upon the earth; of the suffering, degradation, ignorance, and crime that she has transmitted; of the evil she has caused to thousands of innocent families; of the irreparable loss inflicted upon the community, we can to some extent begin to appreciate the importance to the public of the rescue and education of a single little one! Yes, verily! Prevention is better than cure!" (Dr. Barnardo). This case is only one out of thousands of others continually occurring, and illustrating the injuries caused to the general community by neglect of moral and intellectual training. Criminals and ignorant persons are parasites upon the industrious and intelligent portion of society nearly everywhere. "The ignorant Jukes family, including 1,200 descendants, in seven generations cost the American Government £260,000 in relief and prison expenses" (B. Bosanquet, "Aspect of the Social Problem," 1895, p. 303).

Professor Pellmann of Bonn made a similar criminological investigation of a single family of low type. "The founder of this family was a woman named Ada Jurke, born in 1740, who, after pursuing a career as a drunkard, thief, and vagrant, died in the early years of this century, leaving behind her a posterity who have grown to 834 in number. By means of references to police and other official records, Professor Pellmann has been able to trace the life career of 709 members of this family. Of these 142 have been beggars, 64 paupers and dependents upon charity, 181 prostitutes, and 76 have been sentenced for various crimes, seven of which were murders. In 75 years this single family has, according to the Professor's estimate, cost the community, in the form of poor-relief, alms, maintenance in prison, and so forth, a sum of not less than 5,000,000 of marks," equal to £250,000 (June, 1896). Instead of being taxed for the support of

ignorance, it would be very much better to be taxed for the discovery and diffusion of knowledge.

"Neglect of education causes much crime" (House of Commons Report, 1839; Mulhall, "Progress of the World," 1880, p. 167). "That public morality has risen in every country in the same degree as instruction is fully proved by the statistics of crime" (*ibid.*, p. 102). Education of the masses is a great undertaking, so immense, chiefly because every generation requires to be educated afresh, that the community are compelled to submit to the lesser evil of largely allowing ignorant persons to commit error and crime, receive their punishment and improve of their own accord; but there are many persons whose ignorant ideas are so firmly fixed that the most painful experience fails to remove them; and with many conceited ones, often the remedy comes too late.

Erroneous ignorance can be only slowly removed; no sooner has one error been expelled than up rises another. It cannot be suddenly dissipated by religious "conversion"; because the chief cerebral condition, viz., the fixed impressions, remains. There is no cheap way to intelligence or holiness; the only comprehensive and effectual method is by discovering and diffusing knowledge, and this is an extremely slow, laborious, and costly one. This process of cure has been going on in some form or another as long as mankind has existed, otherwise the present state of intelligence would not have been attained. At the present time the amount of ignorance remaining is so immense that its removal will apparently occupy the whole of the spare power of mankind through all future time. If no new knowledge was discovered, and if learning was not diffused by education, etc., ignorance would increase at the death of each generation of men, and mankind would relapse into a state of barbarism; but we know by the steady advance of civilisation that it is gradually diminishing.

The process of converting religious sectarians to the gospel of science has been going on ever since the time of Galileo, when they began to be converted from the untruthful notion of the fixedness of the earth in space; from the time of Magellan, when they had to recant their disbelief in the spherical form of the earth; and from that of Newton, when they had to accept the doctrine that the movement of all the heavenly bodies was governed by the energy of gravitation and not by an omnipotent personal Creator. They have more recently given up the idea of the creation of Adam and Eve in the garden of Eden, and partly accepted the theory of human evolution. They have also largely left to its fate the idea of plenary inspiration of the Bible, and the irrational one of the fall of mankind through a woman having merely eaten an apple; and other unscientific ideas are following these. They have still to give up the irrational doctrines of a personal deity, a Holy Ghost, immortality, a heaven, a hell, salvation, redemption, transubstantiation, infallibility, immaculate conception, and various others. At the present time the masses are to some extent leading their spiritual teachers instead of following them, and the

result will probably be the gradual abandonment of all unprovable dogmas, and the adoption of a purer scientific system of morality and religion—the worship of truth.

54. Necessity and Justification of Ignorance.

Notwithstanding all the "evil" effects of our ignorance, we must accept each other as we are, with all our "imperfections." The energies of Nature determine the existence of ignorance as well as of intelligence, and if ignorance was not necessary it would not be. In accordance with the universal law of causation, all men do as they must, whether their ideas are sensible or not; there is therefore a justification for ignorance, and this justification is substantially similar to that of pain and evil (see sections 37, 38). Ignorance is related to the great facts that civilisation is a slow process, and human beings have very little power to alter its rate; the speed of diminution of ignorance is essentially related to time, and mankind are only the medium through which the energies of the universe gradually work out human progress; as a child must grow to greater knowledge, and must have time in which to do it, so must all mankind. The justification of ignorance lies largely in the law of evolution, according to which all the present conditions of human conduct are the necessary basis of and prelude to all future ones; thus we are all what the past has made us, and all the legends of antiquity, of the Bible, the Koran, the Buddhist bible; the works of Confucius, etc., have rendered great service to mankind. At all times, science is in the van, expedience is in the mass, and ignorance is in the rear.

Viewed in a narrow aspect, ignorance is a great "evil," but when viewed in the most comprehensive one it is only a necessary phenomenon in Nature. In one aspect it appears to be the chief curse of mankind, because it is the greatest source of accidents, wars, and individual suffering; the apparent, however, is often the opposite of the real, and ignorance when examined in the widest manner is found to be necessary to the best rate of human progress. Ignorance is indispensable to progress itself, thus if men had been created absolutely free from it, they would all have been already perfect; in that case there would have been no scope for improvement, no stimulus to learn, no advance, and none of the pleasures which accompany it; human happiness would have been enormously decreased; learning, and the pleasurable expansion of mind attending it, would have been absent; there would have been a dead uniformity, and consequently a diminution of consciousness and of the pleasures of variety. Nearly all the pleasures of life arise directly or indirectly from the labour of pursuing the objects of our desires, and if we possessed infinite knowledge, no labour would be required in attaining those objects, and our minds would be rotted by ennui, through deficiency of exercise. Ignorance, by causing disease and war, has prevented the possibly greater

evil of the human population increasing too fast. In fact, the idea of a world without ignorance is inconsistent with the system of the universe, the properties of human beings, and with all known truths. By the very properties of matter, all living bodies must be in a continual state of conflict; and ignorance, by producing conflict, is necessary to life.

Human ignorance is essentially unavoidable; all the great forces of the universe operate, and all the great processes of Nature are carried out upon this globe largely as if all men were absent, and man and all his belongings are treated as only secondary matters; all mankind are compelled to wade through countless ages of ignorance, in slow progress towards knowledge; and ignorance is only a property of conscious creatures. These facts are not surprising when we consider that the world could exist without man, but not man without the world; and that mankind constitute only about a 100 million millionth part of this little globe; and a single man only about 120,000 million million millionth part.

We should not condemn each other because we are ignorant in part, for if we do, we shall be obliged to condemn all, because no man is perfect; but we should fairly consider and judge each other upon the basis of all the circumstances; we are, however, often compelled to more or less condemn or praise each other off-hand, because life is too short to enable us to fully examine all things, and because this is the only available method. Fair criticism is good for all men. We are unable to practically treat a single human being as if the value either of his body or soul was infinite. The ignorance of an individual is influenced by his environments; in ancient times, men were compelled to be more ignorant than now, ignorance was considered less a crime, and a sense of responsibility has increased with increase of knowledge and civilisation. Poverty of knowledge is like poverty of other good possessions, not necessarily a disgrace if it has not been caused by our own wrong conduct. A man must be ignorant if circumstances absolutely compel him to be so, and in such a case we have no choice but to help him out of it as much as we can. All men, even the most learned are compelled to be ignorant in different degrees; most men are much more ignorant than they otherwise would be, in consequence of being so much engaged in obtaining a living, but if they are not occupied in acquiring knowledge they are usually employed in some other useful work; knowledge is not the only good possession, life is more imperative, a man must live before he can learn, and he must sacrifice knowledge rather than life. The world must be much more extensively peopled, and many more large communities formed, before ignorance can greatly diminish; all other circumstances being equal, the largest communities are usually the most intelligent. Deficiency of knowledge is not all loss, for although it cuts off many pleasures it prevents many pains and anxieties.

Human progress is based more fundamentally upon feeling than upon

intellect; mankind are more influenced by sympathy and affection than by information; society could not exist without mutual affection and kindness; each man also has his own special useful qualities, and if he does not possess one particular good property he possesses another. Persons can usually best appreciate the conditions, feelings, and ideas of those who are in similar circumstances to themselves; hence those who are unintelligent have usually more feeling than the learned for those who are in a similar condition. Ignorant persons as well as intelligent ones have their uses in promoting the happiness and development of mankind, and each man, whether intelligent or not, is a necessary unit in the great army of progress, and influences the speed of advance; we cannot all be leaders or commanders; in this way all the "evil" consequences of ignorance are necessary and useful for the time being to the constitution and development of society. Notwithstanding that ignorance has in the past been the occasion of great crimes, and in the present leads to grievous calamities and atrocities, it is the duty of every one to patiently bear such trials as well as he can, and use them as motives for improvement.

We should not despise ignorance, but remember that much of the rough work of the world is done by ignorant persons, and that they are necessary as well as learned ones to human welfare, otherwise all would be engaged in intellectual pursuits, and there would be none to raise foods or perform bodily labour. We cannot all be learned; twaddle, mummery, and small talk are necessary, and perform a useful function; they soothe and refresh those who believe it, or who have time and patience to listen to it. Ignorant persons are far more numerous than learned and scientific ones, and this is necessary in order to maintain the best rate of advance, because a single intelligent man is equal in influence to many unintelligent ones; with a greater proportion of advanced thinkers, or a smaller one of ignorant persons, the rate of progress of civilisation would be too rapid, and the changes of thought and action would be so violent and great as to destroy all stability of human affairs. The ignorant regulate the rate of progress by their larger number, and the intelligent by their greater mental strength. At all times ignorance and knowledge act and react upon each other, and prevent either going to an extreme.

"Where ignorance is bliss, 'tis folly to be wise," and "'tis better to bear the ills we have than fly to others we know not of"; knowledge may be possessed before mankind are fit to receive and use it. In an imperfect state of civilisation, and therefore at every period, knowledge which is too much in advance of the time is a greater "evil" than comparative ignorance. The greater our ignorance the smaller is our power to accept and properly use new knowledge; even a very little new knowledge is sometimes dangerous in the hands of very ignorant or designing persons; and it is those who possess the most learning and information who are best able to bear more; it was the unscientific portion of the community who could not tolerate the new knowledge evolved by Copernicus, Galileo, Newton, and Darwin, and it is still that section who most retard human progress.

Knowledge is not the only desirable possession; many persons of considerable intelligence in certain ways are very ignorant in others, no man is either entirely wise or completely foolish; each man is a bundle of qualities, some good and others "bad," and whilst the "good" qualities of each man promotes the general advance, his "bad" ones retard it, and both are useful. We know that wealth is often a great power for good and for "evil," and there is probably more of it in the possession of ignorant than of learned persons, because they inherit the products of the industry of their more intelligent ancestors. Wealthy persons of very moderate intellect are often very benevolent and charitable in relieving the necessities of the poor, and if it was not for the large and numerous bequests and gifts of such persons, many charitable institutions, hospitals, etc., could not exist. It is said that "clever men make money for fools to spend," that "the men with money and no brains were made for those with brains but no money," and it is certain that many great commercial schemes could not be tested, nor great undertakings be carried out without the money supplied by ignorant speculators.

There are other ways in which ignorance is an advantage; for instance, opposition to intelligence often incites inquiry, and indirectly promotes the diffusion of truth; in this way the outcry of "anti-vivisectionists" has considerably stimulated public interests in scientific experiments made for the purpose of acquiring physiological knowledge, and has thus advanced our knowledge of preventive medicine, Pasteurism, bacteriology, etc. Erroneous astrology was useful in its time by developing astronomy; the ignorant search for an "elixir vitæ" and "the philosopher's stone" led to numerous discoveries in chemistry; and in a similar manner at the present time sectarian worship, by the inconsistency of its dogmas with truth, stimulates inquiry into the subjects of scientific morality and true religion. Ignorance affords mankind an immense amount of useful and profitable employment; multitudes of men obtain incomes by trading upon the ignorance of each other, and that which benefits both parties to a contract is usually better than that which benefits only one; great numbers of professional men, surgeons, physicians, lawyers, ministers of religion, teachers, scientific experts, and others, obtain incomes in this way. Probably all ignorance has some uses, and if comprehensively examined would be found to produce greater good than "evil"; but natural energy, not human intellect, is best able to decide this question, and to properly balance the rate of human progress.

55. Truth; its Criteria, etc.

This is a large subject. The terms—truth and knowledge—are treated as being largely synonymous; and similar remarks often apply to each (see section 52). "Truth is a wide word, and denotes all that we can ever know of ourselves, the universe, and the Creator" (Archbishop

Thomson, "Laws of Thought," 1875, p. 5). What is truth? and what are its criteria? are questions which have occupied the minds of men in nearly all ages; it is not necessarily "what the soul craves for," nor what we can imagine, because men often "crave for" and imagine that which is untrue. Lord Bacon said that truth and utility are one and the same thing, but this, in the ordinary sense, is not a good definition; because many untruths are considered useful; probably all truth is essentially useful. Truth is vastly wider than knowledge, because it includes that which is unknown. Truth is not an entity but an abstract relation of real agreement. "Truth is the agreement of our notions with the reality of things" (J. Taylor). "Truth of intellect" is "the conformity of thought to thing" (J. Rickaby, S.J., "First Principles of Knowledge," 1896, p. 4). Truth is consistency (G. H. Lewes, "Problems of Life and Mind," vol. ii, p. 516); the agreement of thought or cognition with its object (G. J. Stokes, "Objectivity of Truth," 1884, p. 43). "The essence of all truth is likeness" (St. G. Mivart, "On Truth," 1889, p. 240), The definition of it employed in this book is, truth is that which is consistent with all known facts, and with the widest evidence. According to J. Beattie, LL.D., "it is difficult, perhaps impossible, to give a definition of truth" ("Essay on the Nature of Truth," 1770, p. 3).

Many persons do not seem to know that an universal definition of truth exists; thus, according to the late Cardinal Newman: "No distinct test can be named sufficient to discriminate between what may be called the false prophet and the true" ("A Grammar of Assent," 1870, p. 215). "What is left to us but to take things as they are," and "to confess that there is no ultimate test of truth besides the testimony borne to truth by the mind itself" (*ibid.*, p. 343); this omits the most essential point, viz., the necessity of evidence; we know that the "mind itself" in the absence of evidence is not an "ultimate test of truth," and that whilst the test employed by men of science has enabled them to make hundreds of thousands of discoveries, that of the mind alone has entirely failed. According to a vast amount of evidence supplied by science, truth may be defined as universal consistency, or that which conforms to all known facts, and agrees with the widest experience when examined by all our intellectual powers. This test requires in some cases great labour, time, and expense to apply it, but we have no choice in the matter, truth is usually not so easily tested as some persons imagine; it agrees with the fundamental axiom that two contradictory statements cannot both be true, and with the great fact that the entire universe of knowledge is united by a perfect system of laws, and could not hold together unless all those laws were perfectly true, because the mutually contradictory parts would annul each other. According to Sir John Herschel, "the grand and indeed only characteristic of truth is its capability of enduring the test of universal experience, and coming unchanged out of every possible form of fair discussion." According to Archbishop Thomson, "evidence is the sole means of establishing, and therefore the sole standard for testing the truth

of any proposition"; but in past times, scholastic persons "settled" questions, not by evidence, but by disputation, and many are still vainly trying to do so by means of abject belief in unprovable assumptions. "Truth may be defined as something that is real" (A. Alison, "Philosophy of Civilisation," 1860, p. 194); it is also a cerebral impression of reality, a complete and accurate representation in idea, word, or other mode of expression, of that which is real, in contradistinction of that which is unreal or has had no actual existence. "General opinion is no proof of truth, for the generality of men are ignorant" (Dodsley).

"Universality and consistency are a test of truth" (A. Alison, "Philosophy of Civilisation," 1860, p. 23); statements which by proper logical process lead to absurd or inconsistent conclusions are not true. The usual criteria of truth are agreement with universal causation, evolution, indestructibility of matter and energy, convertibility and equivalence of the different forms of energy, etc., all truth whatever, whether scientific, moral, or religious, must be essentially the same by conforming to all these; and any statement in any subject which is not essentially consistent with them is not true. Truth, like all possible knowledge, is practically infinite, but not actually so; as there are limits to the possible there are also to the true; for instance, it is limited by all contradictions and impossibilities. It has even been seen that "all truth strictly so-called is irrelevant; nothing is left but myriads of differing human experiences which we may disregard, but no established truth. One system of truth is just as good as another; all systems are, in fact, only summaries of differing or contradictory human experiences, which have an equal validity" (W. F. Revell, "Browning's Criticism of Life," 1892, p. 60); according to this unscientific statement there is no universal test of truth.

According to the late Cardinal Newman: "In no class of concrete reasonings, in experimental science, historical research, or theology, is there any ultimate test of truth and error in our inferences besides the trustworthiness of the illative sense that gives them the sanction" ("A Grammar of Assent," 1870, p. 352); his "illative sense," however, is simply the ordinary process of reasoning or inference rapidly performed; and it is evident that inference or reason, however properly performed, is not an "ultimate test of truth" in any subject, unless both its data and its conclusions are consistent with all known facts; the illative operation is only a part of the conditions necessary to secure a truthful result. We may judge of the reliability of this method by his own application of it; thus he says: "The Catholic religion is true because it has about it an odour of truth and sanctity, *sui generis*, as perceptible to my moral nature as flowers to my sense, such as can only come from heaven"; but it is manifest that such feeble evidence as this is altogether insufficient to prove the extremely important conclusion that "the Catholic religion is true." Such a test of such a statement would only be employed by a person unacquainted with the proper test, or who wished to fit the truth to his own feelings; multitudes have done similarly in the same subject. That the

Cardinal was not fully acquainted with the method of scientific reasoning may be further inferred from the following remarks of his respecting the influence of music: "Can it be that those mysterious stirrings of heart and keen emotions, and strange yearnings after we know not what, and awful impressions from we know not whence, should be wrought in us by what is unsubstantial, and comes and goes, and begins and ends in itself? It is not so, it cannot be. No, they have escaped from some higher sphere; they are the outpourings of eternal harmony in the medium of created sound; they are echoes from our home; they are the voices of angels or the magnificat of saints, or the living laws of divine government or the divine attributes; something are they besides themselves which we cannot compass, which we cannot utter" (Maudsley, "Natural Causes," 3rd edition, 1897, p. 29); his reasoning in this case is equally inconsequent as in the previous one.

It is often difficult, without preparatory knowledge, to apprehend some of the simplest truths; that which appears to us inconsistent is in some cases a sign, and even a strong proof, of truth, thus the facts that a balloon rises in air, a cork in water, and a piece of iron in mercury, are not contradictions, but strong confirmations of the attractive influence of the earth. Truth is one, and no truth really disagrees with any other truth, however much it may appear to do so; a fact is a fact for ever, and, as far as we know, truth is eternal in duration. If the same statement was not true of the same thing under exactly the same circumstances at all times in all separate cases, the whole system of knowledge would be disorganised; and this fact is inconsistent with the hypothesis of "divine interposition." Facts are the foundations of mathematics, and of all true philosophy. "Concerning the publication of novel facts, there can be but one judgment; for facts are independent of fashion, taste, and caprice, and are subject to no code of criticism. They are more useful, perhaps, even when they contradict, than when they support, received doctrines; for our theories are only imperfect approximations to the real knowledge of things" (Sir H. Davy). Real truth is in some cases so searching that only the most truthful persons can bear it; the great majority of mankind require it adulterated, and the degree of adulteration required is directly proportional to the strength of their personal desires, their deficiency of a sound philosophy and their ignorance of the rules of scientific inquiry; it is only those who are too weak to bear truth who call it "cold" and "bitter," but this is similar to calling an unfavourable balance at the bank hard and unyielding. All that is true is rational, and he who refuses to receive demonstrable truth, or fixedly adopts fundamental error, is radically defective in knowledge or reasoning capacity.

The perception of truth is usually much weaker in sectarians than in scientific investigators, because they have had less experience in discovering it, and have greater faith in unprovable dogma. As an example of theological "research," the following conclusions were come to by a number of theologians assembled at Bonn, as recently as the year 1875,

to try and reconcile the creeds of the Eastern and Western Churches :— "That the Holy Ghost issues from the Father as the beginning, the cause, the fountain of the Godhead. The Holy Ghost issues from the Son, because in the Godhead there is only one beginning, one cause, by which all that is in the Godhead is produced. The Holy Ghost is the image of the Son, the image of the Father, issuing from the Father, and resting in the Son, as the power reflected by him. The Holy Ghost is the personal product of the Father belonging to the Son, but not out of the Son, because it is the Spirit of the mouth of the Godhead, which pronounces the Word. The Holy Ghost forms the connection of the Father and the Son, and is, through the Son, associated with the Father"; and these inconsistent speculations and metaphysical jargon which no man can clearly understand, are offered to solve the doubts of anxious, inquiring minds. This is truly "offering stones in lieu of bread," or "letting down buckets into empty wells, and growing old by drawing nothing up" (Cowper). Although theology does not usually teach men how to arrive at truth, "theological reasoning professes to be sustained by a more than human power, and to be guaranteed by a more than human authority" (Cardinal Newman, "A Grammar of Assent," 1870, p. 377); but whilst it makes these enormous "professions" it does not prove them. Further, "the Catholic Church makes it imperative on every one, priest and layman, to profess as revealed truth all the canons of the Councils, and innumerable decisions of Popes, propositions so various, so notional, that but few can know them, and fewer can understand them" (*ibid.*, pp. 141, 142); thus, instead of instructing mankind how to arrive at truth, it *commands* them to accept as "revealed truth" numerous unprovable assertions. This quotation supports the conclusion that "No man who has subscribed to creeds and formulas, whether in theology or philosophy, can be an unbiassed investigator of the truth, or an unprejudiced judge of the opinions of others" (D. Page, "Man," etc., Edinburgh, 1867).

Some persons appear to doubt our attainment of truth, and say: "there *may* be truth within our reach" (F. P. Cobbe, "The Spirit of the Age," 1888, p. 168); but science affirms that there *is* truth, and plenty of it, within the reach and comprehension of all persons who will take the trouble to acquire it; the sources of truth are the infinite evidence of the universe, waiting to be interpreted by the help of scientific methods. The bold assertions that unproved theological beliefs are "divinely revealed truths," that "theological reasoning" is "sustained by a more than human power," or "guaranteed by a more than human authority" (Cardinal Newman, see ante), are well-known to lead to unholy, and, in some cases, criminal results. Theology consists largely of ancient hypotheses; the dogma of "immortality of the soul" is very old, that of "transubstantiation" was invented in the ninth century; that of "the Immaculate Conception" was defined as an article of faith in 1854, and that of "Infallibility of the Pope" in faith and morals was decreed in 1870. The doctrine of the Immaculate Conception, that the soul of the Virgin Mary was "without

stain or original sin from the moment of her conception"; that "she was sanctified in the womb of her mother" (F. Molloy, "Faiths of the Peoples," 1892, vol. i, p. 50), is an entirely unscientific and unprovable idea, which mystifies the minds of all persons who try to understand it. The history of theology is one long record of the births and deaths of dogmas; the progress of science has killed many, and appears destined to gradually exterminate the remainder; the doctrine of the earth being the centre of the universe was killed by Copernicus, Galileo, and other astronomers (see Neander's "History of Dogmas," and other works). The audacious assertion of papal infallibility in faith and morals must also decay as a scientific basis of morality becomes known; but falsehood lives and thrives long after truth arrives :—

> "The nimble lie
> Is like the second-hand upon a clock;
> We see it fly, while the hour-hand of truth
> Seems to stand still, and yet it moves unseen,
> And wins at last, for the clock will not strike
> Till it has reached the goal."
>
> —*Longfellow.*

Not unproved doctrine, but "truth alone is qualified to settle, compose, and establish the form of society, and to hold as well as to obtain universal dominion over the minds and bodies of mankind" (G. Moore, M.D., "The Power of the Soul over the Body," 1846, p. 331), then will all men be of one mind in their most fundamental beliefs, as scientific men are to a large extent now, and competition in good works will universally reign, because right thinking leads to correct conduct. "Add to the power of discovering truth, the desire of using it for the promotion of human happiness, and you have the great end and object of our existence. This is the immaculate model of excellence that every human being should fix in the chambers of his heart, which he should place before his mind's eye from the rising to the setting of the sun" (Sydney Smith, "Moral Philosophy," p. 94).

In accordance with the great law of causation, we find that our ordinary ideas of truth are continually sacrificed to necessity; thus the first question usually asked respecting the propriety of any of our actions is :—Is it necessary? are we compelled to do it? and not—does it agree with truth? We all do as we are compelled by our desires, etc., rather than as appears most truthful. Apparent truth when it comes into collision with omnipotent natural energy is usually treated as a secondary matter, and this is the justification of expediency, and of "doing evil in order that good may come"; in the most comprehensive or truly scientific sense, however, real truth always agrees with universal causation and the greatest goodness; and expediency, although not always apparently truthful, is really so, when it chooses the least of two "evils," or a lesser "evil" in

order to do a greater good. As real falsehood does not exist in Nature, the necessary is the essentially true.

"The things which are seen are temporal, but those which are not seen are eternal"; the greatest truths are often the most difficult to comprehend, and the most incomprehensible are frequently those which are universal, such as truth, law, time, space, energy, the ether, essential goodness, etc.

> "There are great truths that pitch their shining tents
> Outside our walls, and though but dimly seen
> In the grey dawn, they will be manifest
> When the light widens into perfect day.
> A certain man, Copernicus by name,
> Some time professor here in Rome, has whispered
> It is the earth, and not the sun, that moves."
>
> —*Longfellow.*

Great truths are nearly always obscure, and the difficulty of perceiving them is largely increased by the fact that the entire universe of phenomena, from the largest to the very smallest, are in a constant state of change, varying from hour to hour; in a state of order and continuity amongst apparently endless disorder and discontinuity, in a condition of stability in the midst of seeming insecurity; the fact of this universal state of change, and the great increase of complexity of idea which attends it, prevents unscientific minds from realising them. As the chief truths of science potentially include all the smaller ones, they must be capable of affording reasonable explanations of all phenomena however changeable, of predicting the future, of detecting all kinds of error, if applied in a proper manner (see section 4). Man's only safety from calamities in going through life lies in obeying natural laws, and in predicting effects before they occur.

In order to solve comprehensive, complex, or profound questions it is not sufficient merely to possess general knowledge of natural history, or practical knowledge of any scientific art, but requires familiarity with all the fundamental laws and truths of Nature; and to treat as secondary all other matters. There are many obstacles in the way of this; comparatively few persons have time to consider both sides of a question, and fewer to examine a subject in all its fundamental aspects; many persons are unwilling to receive great truths, whilst others are afraid to diffuse what they know of them. Why some men can say with impunity daring facts which others are afraid to utter, is largely because they have great principles to guide them, and the principles have omnipotent natural energy behind to enforce them; the reception of truth is not entirely decided by greatness of numbers, thus Copernicus, Galileo, Newton, and Darwin have been more than a match for millions of unscientific sceptics. Notwithstanding the omnipotence and importance of truth, the evolution of it is dependent upon time and circumstance; great truths usually wait a long period

pregnant in the womb of time until the proper periods arrive for their general acceptance; they are often imagined long before they are proved, but they are then only guesses, which by further evidence become hypotheses, and are finally proved by sufficient verification. It took more than two hundred years for the Copernican theory to be fully accepted.

A great deal has been said by various philosophers and metaphysicians respecting "the unknowable," as if there really existed a special kind of truth which from its very nature was incapable of being known in any degree. Passing over the contradiction of ideas involved in the notion of unknowable knowledge, I venture to remark:—1st, the really unknowable is the non-existent, the impossible, the supernatural, the untrue; 2nd, every truth, including all those which are at present unknown, must have relations to known truths, and is therefore capable of becoming, sooner or later, more or less known by means of them. There can be no truths without such relations (see section 4), and therefore no "unknowable ones"; 3rd, throughout all human history, much that was considered unknowable at one period became known in subsequent ones; and the deepest known truths have required still deeper ones to explain them; 4th, those possible truths which are called "unknowable" are gradually becoming known, and as far as science enables us to foresee, there appears to be no definite end to this process; 5th, the extent of "unknowableness" of any possible truth depends upon the degrees of its abstrusity and complexity, and of man's powers to render it manifest and appreciate it, there was a time when universal gravitation, the universal ether, the principles of universal evolution and continuity were "unknowable"; 6th, all truth is knowable in itself, and the unknown portion is a continually decreasing one; and 7th, it is not because matter and energy are practically infinite, nor because they are continually changing in property and form, nor because there always remains an apparently infinite remainder of truths respecting them to be known, that the more recondite truths are for the time "unknowable," but because of the relative feebleness of man's mental and other powers. None but a superhuman mind would be able to remodel universal thought so as to make it completely represent universal truth.

> "At the end of every road there stands a wall,
> Not built by hands—impenetrable, bare.
> Behind it lies an unknown land. And all
> The paths men plod tend to it, and end there."
> —*Quotation by N. Porter*, "Science and Sentiment," 1882, p. 403.

Truth is certain, and all truth must be equally so because certainty is its essential characteristic; any statement which is not intrinsically sure is not true; its certainty depends upon its being inseparably related to law and order, and laws must be certain otherwise they could not coexist; their very coexistence is a proof of their certainty. As evidence of this we know:—1st, that the human organism is very complex,

and if either the heart, lungs, brain, stomach, liver, etc., is diseased or acts irregularly, the whole organism is either disturbed or its action stopped; 2nd, that all the chief powers of Nature operate in the human system, and in a state of health the whole of the organs work regularly together, thus proving that all these powers are capable of harmonious action; and 3rd, that the universe is an infinitely more complex machine, and, similarly to the human one, if any one of the chief energies which pervade it was opposed to the others, the entire machine would be disorganised, and could not continue in action. The very fact that the human organism and the universe can coexist, and all their parts act harmoniously together when under normal conditions, proves that the great system of power, which pervades them must be certain and consistent. Further, as the human mind is immeasurably feeble in comparison with the magnitude and complexity of the universe, and utterly unable at present to completely comprehend it, even after the fullest study; and as the apparent is often the very opposite of the real, and the more we study the universe the more perfect it is proved to be, we may rationally conclude that any apparently inharmonious action in Nature or in the human organism is not a real exception to the certainty of those powers and laws but only an apparent one, and really confirms them. The violent phenomena, such as earthquakes, revolutions, wars, etc, which we see in Nature are only the more rapidly occurring or accumulated effects of the actions of harmonious powers.

"Truth need not be universal, but it must of necessity be certain" (Cardinal Newman); all truth is unalterable for ever, irrespective of creed, time, or place; and its certainty proves its religious character. The guarantee of certainty in science is omnipotent energy, immutable law, and universal consistency; in science we have the assurance that whatever has happened must happen again without fail under exactly the same circumstances, because it is determined by those conditions. According to St. G. Mivart, "certainty does not pertain to sensation, but to thought alone" ("The Groundwork of Science," 1898, p. 14); "Thought only is and must be our supreme, ultimate, and absolute criterion" of truth; "Self-evidence is the necessary and only criterion of truth" (*ibid.* pp. 227, 224); "The ultimate ground of certainty is and must be its own intrinsic self-evidence" (*ibid.*, p. 277); if these statements are correct, external evidence is not needed to enable mankind to perceive what is true; but, according to science, neither "thought only," nor "self-evidence" alone are the most reliable tests of truth; because neither the deepest meditation without comparison with the widest evidence, nor "self-evidence" without the corrective power of the intellect, lead to the highest certainty. Certainty varies in degree in different cases from nothing to infinity; thus we have the certainty of our senses and feelings in subjective visions and dreams, which is often less than nothing and extremely fallacious; we have that of our senses in our waking state, and this is often delusive; we have the vastly higher

degree of certainty in the form of great truths and laws arrived at by inductive inference from multitudes of consistent facts, and we have the immeasurable degree of certainty of deductive inference afforded by the further use of those truths and laws in the successful prediction of future events; and this is often to all intents and purposes infinite; *i.e.*, it is in many cases a probability of millions of millions to one, and whether we consider it "absolute" or not is quite a secondary matter.

Although all truths are certain in themselves, they do not appear equally certain to us, because our faculties are so extremely limited. Whilst to an infinite mind all truths must be equally manifest, to us, not only the infinite system of truth which represents the limitless scheme of Nature, but even the atomic construction and molecular motions of the smallest particle of solid matter, appear infinitely complex and beyond our clear comprehension. Simple ideas are not necessarily true any more than complex ones; science has abundantly proved that simple explanations are often erroneous ones. There are plenty of cases which we are unable to completely investigate, but in which the conclusions, as far as they go, are as true and certain as those we have fully examined; they are those of which we know the essentials. Accuracy is not a sufficient proof of certainty unless the fact stated, or the thing or action measured, is itself certain; we must possess a thing, or know a fact or action, before we can measure it. All truths are equal to each other in the sense of being certain; thus the facts or premises of a proper logical inference are equal to the conclusion drawn from them; and they often implicitly contain more than the conclusion.

One of the strongest proofs of certainty is successful prediction; if we calculate beforehand that an eclipse of the sun by the moon will occur at a certain hour and minute, and it occurs exactly at that time, we may rest assured that our knowledge upon that point is certain and essentially complete. "Coming events cast their shadows before them," and in proportion to the certainty and accuracy of our fundamental knowledge are we able to predict them. If we say that a certain bright line in the solar spectrum is due to a new substance, and we, thirty years afterwards, actually obtain some of that substance ("helium"), we may be sure that the original basis of our predictions was without essential defect. Whilst the weather cannot be forecasted accurately even for a month in advance, the exact periods of eclipses can be prophesied with certainty for hundreds of years to come; and the essential explanation of the difference is, that whilst the weather depends upon a large number of complex and very variable conditions, the eclipses depend upon a few simple mechanical laws. In nearly all cases there are many ways of going wrong, but only one of going right; the probability of arriving at error instead of at truth is usually so great, that if the essentials of astronomical knowledge were not complete and accurate in each particular case, the predicted eclipses, transits, etc., would not occur at all or not at the predicted time. Time is a great test of truth—first, because it affords opportunity for confirmation

and rejection; and, second, because the gradual extension of knowledge supplies new checks upon error. We have far better intellectual appliances to help us in the discovery of truth and the detection of error than our ancestors had :—

> "The star will come. It dare not by one hour
> Cheat Science, or falsify her calculation;
> Men will have passed, but, watchful in the tower,
> Man shall remain in sleepless contemplation;
> And should all men have perished in their turn,
> Truth in their place would watch that star's return."
> —*Prudhomme.*

"Truth casteth out fear"; nothing encourages us so much as certainty; when we are uncertain we do not know what to do. We know that if we have once discovered all the conditions of some phenomenon, or of some process, the reproduction of exactly the same conditions will ever afterwards enable us to invariably reproduce the same result. Even the discovery of law is itself subject to law; that of gravitation could not have been found at an earlier period than it was. Science differs from empiricism, because when we are empirically working a process according to "rule of thumb" method, if any unusual difficulty occurs we do not know how to act; but if we know all the scientific principles of the case, we are enabled to determine whether it is possible to overcome the difficulty.

It is frequently asserted that the ideas of faith are more certain than those of intellect and reason; for instance, "it is true that faith transcends such certainty as belongs to the intellectual taken apart—a physical or a mathematical certainty" (R. C. Moberly, D.D., "Reason and Religion," 1896, p. 83). "With knowledge, experimental or demonstrative, we habitually contrast it; that is, with such knowledge as belongs to the merely rational intellect. But the knowledge which is of faith can be the most absolute and certain form of knowledge" (*ibid.*, p. 82); this, however, is only true provided it is based upon proper and sufficient evidence. The late Cardinal Newman also speaks of "divine faith, which has a supernatural origin, when compared with all belief which is merely human and natural," . . . "being superior in nature and kind" and "above experience" ("A Grammar of Assent," 1870, p. 179); he does not, however, explain how faith without experience is "divine," nor how it is "superior" to that with experience. There can be no secure faith in that which is unprovable or contradicted by proper and sufficient evidence. It is misleading to offer as "the most absolute and certain form of knowledge" that which is only unproved belief. "The bare testimony of revelation is the highest authority, only we must be sure that it be a divine revelation" (John Locke); but therein lies the difficulty; who can prove that it is a revelation? the only revelations known to science are discoveries based upon evidence.

According to the same high theological authority (viz., Cardinal New-

man), "without assumptions no one can prove anything about anything" (*ibid.*, p. 405); to an astronomer, however, the measurements of astronomical magnitudes, by means of which eclipses and transits are predicted and verified by actual occurrences, are not "assumptions," and are proved not to be so by the verifications; and, certainly, if these are in any degree "assumptions" how much more so must be the numerous assertions which theologians call upon all men to believe without any real evidence and in opposition to it? The same writer also states that, "No distinct test can be named, sufficient to discriminate between what may be called the false prophet and the true. What looks like certainty always is exposed to the chance of turning out to be a mistake" (*ibid.*, p. 215); according to this latter statement, two and two may not be four in some cases.

In scientific research we often use hypotheses as questions to be tested and as temporary ideas to guide us in the inquiry; we also place some degree of probability and faith in them, but the hypotheses, and the faith in them, are very different from those in theology. Thus whilst the hypotheses in science are largely consistent with the great truths of Nature, those in theology often flatly contradict them; whilst also scientific hypotheses are not usually allowed to become fixed beliefs until proper and sufficient evidence has been obtained to prove them, those of theology are powerfully and cruelly forced upon unsuspecting children and converts, and fixed as firmly as possible without proper and sufficient evidence of their truth. This misuse of theological hypotheses is in harmony with the statement, "that the Church is the infallible oracle of truth is the fundamental dogma of the Catholic religion" (Cardinal Newman, *ibid.*, p. 148), and being so it claims the right to require unlimited faith in its hypotheses. According to Martin Luther, "there is only one mortal sin, and that is want of faith." . . . "You may abandon your wife or desert your husband, or not keep any engagement you have contracted, for what concerns it to God, whether you do these things or not" (Rev. F. M. Slater, "Justification of Life," 1888, p. 167). The morality of this advice will not bear examination. Theology is as manifestly permeated by unprovable hypotheses as ordinary trade is by deceit.

There is no royal road to truth in any subject, and we have no easy way of arriving at it in mental and moral questions. It is only as man becomes enlightened by means of new knowledge, especially in physiology and psychology, that he acquires the ability to view himself in a true aspect apart from his consciousness. Scepticism of miracle and dogma often precedes the reception of truth. "There lies more truth in honest doubt, believe me, than in half the creeds" (Tennyson). If a man possesses a good stock of fundamental scientific knowledge he may obtain a large amount of new and valuable truth by asking himself questions on important subjects and endeavouring to answer them. We are, however, properly reminded that "life is for action. If we insist upon proof for everything, we shall never come to action; to act you must assume, and that assumption is faith" (Cardinal Newman, "A Grammar of Assent," 1870, p. 92); it is

quite true that we have not time to investigate everything, but as long as we know that a statement has been properly verified, it matters not by whom, there is no assumption, the faith is based upon proper and sufficient evidence. We often may not justifiably postpone our acquisition of proof until the period of action arrives, and there is no time for investigation; but it is a moral duty of all men to prepare for the future. We must seek truth now and always; "now is the accepted time, now is the day of salvation." "Men miss truth more often from their indifference about it than from intellectual incapacity" (Archbishop Whately, "Detached Thoughts and Apothegms," 1856, p. 9).

The scientific method of arriving at truth consists largely of the process of inference; *i.e.*, by comparing the evidence, viz., the facts or verified laws, and drawing conclusions from them. The conclusions or inferences we draw may be either by the process of induction or by that of deduction. "Induction is the process of discovering laws from facts, and causes from effects; and deduction that of deriving facts from laws, and effects from their causes" (Archbishop Thomson, "Laws of Thought," 1875, p. 216). The late Cardinal Newman, in his "Grammar of Assent" (1870), put forward what he termed "the illative sense" as a means of arriving at truth. He contended that our belief in the invariability of the laws of Nature is an inference only; that an inference is merely a probability and never attains to certainty; that the fact that the laws of Nature have always been obeyed in the past is not an absolute proof that they will be so in the future; that the uniformity of their action is only probable and does not justify our complete assent; and having, as he supposed, thus shown some degree of uncertainty of science he proceeded to argue that we possess an "illative sense," *i.e.*, a reasoning "sense," by means of which in a mysterious way truth can be instantly attained in concrete subjects. As I have already disposed of the objection that inductive inference can never attain to absolute certainty (see section 11), I need not say much on that point here, but will remark:—(1) that owing to our feeble mental powers and the immensities, complexities, and profundities of Nature, we know very little of the absolute in any subject; (2) that in various cases, for instance, in the successful prediction of eclipses, and of the existence of undiscovered substances, deductive inference possesses the highest degree of certainty, sufficient for all human purposes; and (3) that however uncertain such inference may appear to be to those who, like Cardinal Newman, prefer to believe in "divine faith" and in so-called "miracles," rather than in science (see pp. 48, 474), it is incomparably more certain than various theological predictions and dogmas, such as those of a Second Advent, Resurrection of the Body, transubstantiation, papal infallibility, etc., because it is based upon proper and sufficient evidence, whilst the latter are not. As scientific deduction enables us to successfully predict eclipses a hundred years forward, and calculate them hundreds of years backward, it is futile to debate about absolute certainty, which is beyond the powers of human conception; as also it is a moral duty to proportion the

strength of our belief to the degree of probability of an inference, and although the inference is not absolutely certain that a man will die, as the probability is millions of millions to one that he will, it is irrational to doubt that he will; similarly, as the probability is equally great that no man is infallible in the subjects of faith and morals, it is irrational to believe that he is.

The following is a fair sample of instances of the manner in which theologians try to arrive at truth in some questions, and are taken from a book on "The Relations between Religion and Science," by the Right Rev. Frederick, Lord Bishop of Exeter, 1885. The writer says: "The teachers of other religions beside the Christian have claimed supernatural powers, and have professed to give a supernatural message. This is strong evidence of the deep-seated need in the human soul for such a direct communication from God to man. Men seem to need it so much that without it they are unable to accept the truth, or to hold it long if they do accept it" (*ibid.*, p. 155). This is very weak evidence of the possession of "supernatural powers" by teachers of religion. The existence of a "deep-seated need" in the human mind is not proper and sufficient proof that the thing desired really exists or can be obtained; nearly all men wish to obtain not only all the good things they can get, but a great many more; many selfish persons feel a "deep-seated need" for the property of others, or for various pleasures which either have no existence, or which they cannot obtain.

"Revelation takes a higher stand than belongs to all other teaching" (*ibid.*, p. 157). According to this assertion, the teaching of statements which cannot be proved takes "a higher stand" than those of scientific truths which have been carefully verified in multitudes of cases. The assumption that "revelation takes a higher stand" than scientific evidence is a dangerous one, and has induced "religious" persons to commit very many cruel acts. According to Max Müller, most religions have been believed by their followers to have been revealed ("Natural Religion," 1892, p. 51); but no one appears to have been able to clearly define religion; amongst those who have attempted are Kant, Caird, Pfleiderer, Martineau, Schenkel, J. H. Newman, Lotze, Seeley, Göethe, Spinoza, Schleiermacher, Hegel, Fichte, Wundt, Feuerbach, Gruppe, Strauss, Weisse, Argyll, and Max Müller (*ibid.*, pp. 60, 67, 69, 73, 74, 81, 114, 126, 188); nearly all of whom give different definitions. According to Dr. Gruppe, "religion exists simply because it satisfies certain selfish interests of man," and its rapid spread has been partly due to "the unconscious vanity of its founders" (*ibid.*, pp. 75, 76); according to Max Müller, "religion consists in a perception of the infinite so as to influence the moral character of man" (*ibid.*, p. 188); also, "anything that lifts a man above the realities of this material life is religion" (*ibid.*, p. 568); he also remarks respecting the definitions of it: "Religion is said to be knowledge, and is said to be ignorance. Religion is said to be freedom, and it is said to be dependence. Religion is said to be desire, and it is said to be freedom from all desires.

Religion is said to be silent contemplation, and it is said to be splendid and stately worship of God" (*ibid.*, p. 43). This contradictory evidence does not support the assumption that "it has been revealed," or the claim that revealed religion "takes a higher stand than belongs to all other teaching." If "religion consists in a perception of the infinite," then it is largely a consequence of our knowledge of geology, astronomy, the telescope, the spectroscope, and the microscope, which has so greatly extended the sphere of our perceptions.

The same writer (*i.e.*, Bishop Temple) speaking of science, states: "We are quite powerless to make protoplasm, or to show how it is made, or to detect Nature in the act of making it." . . . "The creation of life is quite unaccounted for" ("The Relations between Religion and Science," 1885, pp. 168, 169). This is largely true, but it does not prove that we shall not be able to do so in the future, nor disprove what has already been done; we formerly could not artificially make alizarine, indigo, alcohol, etc., from inorganic materials; we could not account for the tides, the rainbow, thunder, lightning, eclipses, and a multitude of other things, which we can now more or less fully explain; we could not make a steam-engine; even the nature of life is now much more understood than it ever was. Further, he states: "The creation of life if unaccounted for, presents itself as a direct interference in the actual history of the world." "As it stands this is a great miracle" (*ibid.*, p. 170). It, however, by no means follows that, simply because an action is not completely accounted for at present, it is a "direct interference" or "a great miracle." Multitudes of so-called "miracles" were believed in the middle ages which are disbelieved now; the creation of life may possibly be accounted for by extension of scientific knowledge.

"Revelation asserts its right to set aside the uniformity of Nature to leave room for a direct communication from God to man" (*ibid.*, p. 194). With regard to this bold assertion we may affirm that unproved "revelation" has not the "right to set aside" well-verified natural knowledge, and we may fairly ask:—(1st) does revelation really "set aside the uniformity of Nature?"; this point has never been proved, and does not appear likely to be; and (2nd) by what means do unproved statements, dignified by the term "revelations," set aside the omnipotent powers and immutable laws, by, and in accordance with which, the universe and mankind are governed? Again:—"As far as scientific observation has yet gone, the first introduction of life was a miracle. No one has ever succeeded in tracing it to the operation of any known laws" (*ibid.*, pp. 197, 198). The first part of this statement is an assertion which has never yet been proved, and the second may yet be explained by the theory of evolution with the aid of further scientific research, especially research into the molecular motions of substances; such great questions require great time and labour to decide them.

"When the utmost extent of human knowledge is compared with the vastness of Nature, the claim to extend the induction" (viz., of "the uni-

formity of Nature") "from generality to universality is seen to be utterly untenable" (*ibid.*, p. 118). The truth or fallacy of this statement depends upon the kind of case; just as two and two make four universally without our requiring to make a trial in every new instance, so are there many cases in science where we may extend the induction from generality to universality with complete justification, without waiting for verification in every new case, for instance, in the calculation of eclipses and transits of the heavenly bodies; in all the instances of the influence of gravitation, in all those of production of magnetism by electric currents, in all the millions of calculations of weight of substances in chemical actions; and a variety of others which need not be mentioned (see section 11 on "Universality of Causation" for more complete argument). We may justifiably extend induction from the general to the universal in all cases of universal energy and law; and a man who is not certain that the predicted effect will happen in such cases, or that the sun will rise to-morrow until it has actually occurred, must be left alone in his unbelief. The best test of a man's belief is his conduct; if he asserts that he does not believe in the universality of natural law, and therefore not in any phenomenon until it has actually happened, and we observe that his conduct on all occasions contradicts his belief, we conclude that he is a self-deceived person. "The believer in God knows that the truth" (viz., "the spiritual truth") "which he holds is as certain as the axioms of mathematics" (*ibid.*, p. 234); this assertion would be much more truthful if the word "believes" was substituted for "knows."

"Science will continue its progress, and as the thoughts of men become clearer it will be more plainly seen that nothing in Revelation really interferes with that progress" (*ibid.*, p. 219). This statement appears inconsistent with the previously-made assertion that revelation can "set aside the uniformity of Nature," and with the fact that nearly every great scientific discovery has been greatly opposed by theological expounders of "revelation." "The students of the Bible will certainly learn that Revelation need not fear the discoveries of science" (*ibid.*, p. 220); but the fact remains that the discoveries of science have already disproved some of the most important of the so-called "revelations," and will probably disprove many more. "It is granted on all hands that miracles are, and ever have been, exceedingly rare, and for that reason need not be taken into account in the investigation of Nature" (*ibid.*, p. 229); compare Dr. Brewer's "Dictionary of Miracles," a large volume filled with descriptions of many hundreds of them; it is a considerable and quite modern concession to science to admit that they "ever have been exceedingly rare." In theological writings the natural and the supernatural are often hopelessly mixed together. From the foregoing, and many other examples furnished by different theologians, we may infer that theological doctrines largely unfit persons for discovering or receiving scientific truth.

Devotion is a very unreliable test of truth. Even the voluntary sacrifice

of his life by a man to a belief or idea is not a proof of its verity, because it is well-known that punishment of the body frequently fails to alter the mind, that many men have yielded up their lives in defence of ideas which are demonstrably untrue, and that men are often quite unable, even if they desire, to abandon firmly fixed impressions, whether they are true or false. Popularity, or the applause of incompetent judges, is another very imperfect test of truth; and that which all ordinary persons disbelieve is not necessarily false. The certain test of truth is not the universal wishes, longings, feelings, or beliefs of any sect, nor even of all mankind. The fact that beliefs influence human conduct is far from being sufficient evidence of their truth; it has however been said :—"The Catholic religion is true, because its objects, as present to my mind, control and influence my conduct as nothing else does" (Cardinal Newman, "A Grammar of Assent, 1870, p. 205); but men are often controlled and influenced by a great variety of beliefs which have no real representatives, or are quite unprovable.

An old, but very fallacious, method of trying to discover truth was by assuming that phenomena were necessarily due to an "only conceivable cause"; as if our extremely finite minds could reliably solve great and complex natural questions by merely thinking about them without obtaining proper and sufficient basis of knowledge beforehand. The following are illustrations :—"The only form in which it is possible for us to conceive of a truly originating and determining force [or Cause] is that of a Will; and the only Will of which we are able to conceive is one which, like our own, is guided by Intelligence towards a Purpose" (J. J. Murphy, "The Scientific Bases of Faith," 1872, p. 201). Further: "Will any man in his senses say that it is less difficult to conceive how the world came to be, and to continue as it is, without, than with an intelligent author and governor of it?" (Butler, quoted by W. S. Lilly, "Ancient Religion and Modern Thought," 1896, p. 246); as if that was necessarily true which fallible men are "able to conceive." Again: "It seems to me that the logical following of Mr. Spencer's own method leads us to the conclusion that what we call the laws of Nature are the unchanging visible expression of volition; that this is the only possible name under which we can gather up the mighty forces ever energising throughout the boundless universe; that matter, therefore, is merely a manifestation of Will" (W. S. Lilly, "The Great Enigma," 1892, p. 231). The result of the method employed in each of these particular cases is, of course, a failure, because it assumes that there exists an intelligent will throughout all space without the presence of an infinite brain to manifest it (see section 6). Another fallacious method is that of accepting "common consent," or "universal consent," as a sufficient proof of truth :—"The authority of the Church is the authority of common consent" (J. J. Murphy, "Scientific Bases of Faith," 1873, pp. 180, 181). This "common consent" is very little different from the dicta of "common-sense," or "the voice of the people is the voice of God," no matter how difficult the question or how ignorant or unscientific

"the Church" or "the people" may be in the particular subject. How can "the Church" or "the people" be more competent than men of science to determine scientific questions, such as the existence of our mental faculties without a brain, or after death, the presence of millions of millions of spirits, or of an infinite brain in interstellar space, etc.? "Habit with some men is the sole test of truth; it must be right; I've done it from my youth." This test is equally fallacious.

Although the universal test of truth is consistency with all known facts, and this appears simple, there exists no easy method of discovering truth applicable to all cases; numerous difficult experiments or expensive researches carried on for years may have to be made in order to obtain the evidence, and after all our labour and sacrifice we are often obliged to be satisfied with only an approximation to certainty, or it may be even with a mere probability, and be consoled with the reflection that as long as we possess nothing better, "probability is the very guide of life." Frequently we are dependent for the necessary evidence upon circumstances entirely beyond our control, and may have to wait many years before we can obtain it. In astronomy this frequently happens; similarly, we are now waiting to settle many questions respecting the human mind, and many in the complex subjects of sociology and religion. It has been stated that it took twenty centuries to ascertain the true nature of coral. "The character of the true philosopher is to hope all things not impossible, and to believe all things not unreasonable" (Herschel).

A discoverer is much like a traveller inquiring his way in an unknown land; he has continually to ask questions, and to make suppostions, before he can proceed with his experiments, whilst at the same time he has certain leading ideas to direct him. He is largely guided by the great truths: (1) that every new substance or form of energy, and every new combination of matter or its energies, produces new effects, unless some preventive conditions are present; (2) that every new effect may be produced either by a new substance or by a new arrangement of matter or its energies; (3) that whenever we perceive or compare any truth, or class of truths, in a new aspect, we obtain new knowledge; and (4) that whenever we place matter or its energies under new conditions, new effects must ensue ("Art of Scientific Discovery," 1878, p. 458). We must in some cases ascertain what is true by first finding what is not true; this is the method of exclusion, and is sometimes employed by inventors who ascertain what will do by first determining what will not do. The greatest guides in discovery are analogy and continuity (J. P. Cooke, "The Credentials of Science," 1893, p. 260).

"Nothing great is easy" (Plato); "all noble works are difficult." "The world little knows how many of the thoughts and theories which have passed through the mind of a scientific investigator have been crushed in silence and secrecy by his own severe criticism and adverse examination; that in the most successful instances not a tenth of the suggestions, the hopes, the wishes, the preliminary conclusions, have been realised"

(Faraday). Darwin also said, "I worked on true Baconian principles, and, without any theory, collected facts on a wholesale scale, more especially with respect to domesticated productions, by printed inquiries, by conversation with skilful breeders and gardeners, and by extensive reading. When I see the list of books of all kinds which I read and abstracted, including whole series of journals and transactions, I am surprised at my own industry." We might very properly say "go thou and do likewise" to those who make such remarks as that scientific men "are quite powerless to make protoplasm, or to show how it is made, or to detect Nature in the act of making it," etc., etc.

There are numerous comprehensive statements in science which agree with the universal test of truth; for instance, a thing must be or not be; a thing cannot both be and not be; contradictories cannot coexist; a substance cannot be and not be at the same time in the same place, nor in two different places at the same time; a self-contradictory statement cannot be true; two contradictory statements or hypotheses cannot both be true, but both may be false; a whole is greater than its parts; things equal to the same thing are equal to one another; a figure which possesses three equal sides must have three equal angles; every effect must have a cause; we cannot annihilate either matter or energy; a body in a state of motion must continue in motion until some cause arises to prevent it; a body cannot be moving in opposite directions or with unequal velocities at the same time; action and reaction are equal and opposite; and various others; the contrary of all of which are considered absolutely untrue and impossible by scientific men. As an approximation, therefore, to a criterion of truth, we may say it is that which is perfectly consistent with the "axioms of logic," the "laws of thought," and the great laws and principles of science.

There was a time when various of these truths were not known, but as science advances we discover a greater number of its axioms and laws, and the uniformity of human belief on essential points enlarges. The ancient axiom that the circle was the most perfect of figures, that natural motion must be circular, that the planets must move in circular orbits, was believed previous to the time of Kepler, but is now no longer an axiom. Some great truths which are unattainable in one age and state of knowledge become attainable in another; for instance, the laws of electro-magnetism and of electro-chemical action, with their applications in the dynamo and electro-plating, could not have been arrived at in an age when electric currents were unknown, nor could the great principles of indestructibility, conservation, and equivalence of matter and energy, have been established at an earlier period than they were, or without the necessary scientific appliances; even the discovery of the law of gravitation had to wait sixteen years for the completion of the necessary evidence, and that of the universal ether till a much later period. It took Darwin nearly twenty years to produce his theory of evolution by natural selection. Probably the greatest and most occult truth will only be found when all

the less occult ones are known; it is by means of wider and wider inductions that the greatest truths are discovered.

In matters of science it often happens that explanations which are inconceivable by an ignorant man, or, it may be, by most men, are the only true ones; thus the first law of motion, that a body in a state of motion will continue for ever in that state if nothing arises to prevent it, now known as an axiom, was inconceivable before the time of Galileo, and, when first proposed, was objected to as being contrary to all experience! In order to convince different persons of the truth of a particular statement, it requires the same idea to be reiterated in different forms of words. It often requires a trained mind to perceive a truth, even in its most simple form, whilst a fallacious statement, especially if it is a flattering one to the reader, presented in his own style of language, professing to espouse his cause, remedy his wrongs, alleviate his sufferings, or enable him to easily obtain some advantage, is usually more readily accepted than the true one; examples of this are common in the writings of socialists and sectarians.

With regard to the question, what is the mental faculty by means of which we detect and apprehend truth? all our experiences, when corrected by the powers of the intellect, unite to prove that the mind in general, and the reasoning faculty in particular, are the means by which alone, acting upon all the evidence supplied, we are able to distinguish truth. In consequence of the essential nature of truth being the same in all subjects, and of the chief processes of mental action employed in the determination of it being alike in all, the essential methods of arriving at and detecting moral and religious truth are precisely the same as those employed in the physical and chemical sciences; and upon this circumstance depends the fact that a "scientific basis of morality" and religion is possible. We possess no one mental faculty alone, call it "conscience," an "Illative Sense," the "reasoning power," or what we may, by means of which we are enabled to infallibly arrive at truth in any question; the intellect alone, acting upon all the evidence, is the final arbiter in all cases. The truth of moral, social, religious, and theological questions must be examined by the faculties of memory, perception, observation, attention, comparison, and inference, and by the process of observing facts, comparing them, and inferring conclusions; also by analysing, combining, permutating, and cross-examining the whole of the facts and evidence in every possible way, and extracting from them the largest amount of consistent knowledge.

Some persons seem to think that there exist other means of arriving at truth than the scientific ones; thus, "so splendid have been the achievements of this method" (the scientific) "that we are accustomed to meet, and need to be on our guard against, not merely a claim for the acceptance of scientific results within their own sphere, but (what is more formidable) a claim that the scientific canons and methods of thought, and the hypotheses upon which they work, are the only canons and hypotheses upon which knowledge can be based" (R. C. Moberly, D.D., "Reason

and Religion," 1896, p. 110). In reference to these remarks, science claims no monopoly of hypotheses, there are plenty of them in other subjects; it is not "knowledge," but merely belief that is based upon them; science is only founded upon proper and sufficient proof, scientific hypotheses are merely temporary assumptions to be tested or questions to be answered, and to be permanently accepted or rejected, only after sufficient trial. "Scientific canons and methods of thought," the mental rules, and methods of observation employed in arriving at truth, are essentially the same for all men, and are the only ones "upon which knowledge can be based" in all subjects, and must be so because the same instrument (the human brain) must be employed, and the same effect (arrival at truth) has to be attained. Science knows only of natural laws and methods, but if theologians really possess, as intimated in the foregoing quotation, other more reliable "canons and methods of thought," upon which knowledge, and not mere belief, can be rationally based, it would be a very great blessing to mankind to disclose them and prove their existence by means of proper and sufficient evidence, and equally cruel to withhold them. According to Hallam, the Scriptures "had not untied a single knot, or added one unequivocal truth to the domain of philosophy" (Clodd, "Pioneers of Evolution," 1897, p. 75); and whilst there have been hundreds of thousands of truths discovered by scientific or natural means, there does not appear to be a single well-verified one indubitably arrived at by the supernatural or other non-scientific "canons and methods of thought" so strongly advocated by theologians; nor by the aid of the enormous advantage which "divine revelation" or the "infallibility in faith and morals," if it was really possessed, would confer.

It has been further stated, that "it can never be true to the theologian that theological truth," (dogma?) "because based upon revelation," "is, intellectually speaking, on a lower or less rational level than the truths of inductive exploration" (R. C. Moberly, D.D., "Reason and Religion," 1896, p. 121). According to this statement, notwithstanding that theological dogmas are largely based upon "the hypothesis of revelation" (*ibid.*, p. 121), without proper and sufficient evidence to prove them, they are not upon "a lower or less rational level than the truths of inductive exploration," which are entirely based upon rational proof, and abundantly verified. Fortunately for the cause of truth and the progress of mankind, it does not rest entirely with theologians to decide what is true and what is false in "revelation," but also with scientific men, because it is a question of evidence, and before the former can convince the latter that theological dogma is "truth," they must adduce suitable and sufficient proof that the "revelation" itself is real and true. Truth can "never be true" to any man if it contradicts his fixed beliefs.

Science is orderly knowledge. Without the truthful consistency afforded by great general truths and principles, human knowledge would be a chaotic and unmanageable mass of facts and opinions. "Science arises from the discovery of identity amid diversity" (S. Jevons). Facts are

usually discovered before general truths and laws, and are then by means of generalisation formed into comprehensive truths, or by induction into general principles. "Generalisation is the act of comprehending under a common name several objects agreeing in some point which we abstract from each of them, and which that common name serves to indicate" (Archbishop Whately). "Generalisation is only the apprehension of the one in the many" (Hamilton). "A law of Nature, once announced by Science, is a necessity of thought that we should give to its uniformity and invariability our full and unqualified assent, in the face of all alleged facts or religious doctrines whatever opposed to it" (Crozier, "Civilisation and Progress," 1892, p. 77).

The discovery of new truth, by whomsoever made, is a true revelation; the real high priests of mankind are those who evolve great truths, such as Euclid, who revealed geometry; Copernicus, Kepler, and Newton, astronomy; Volta, chemical electricity; Oersted, electro-magnetism; Faraday, dynamo-electricity, and largely electro-chemistry; and Darwin and others who developed the great principle of evolution, and the fruits of whose labours are a multitude of blessings to mankind spread all over the earth. These are the class of men who are likely to know most about the powers which regulate the universe and mankind, and the nature of a single great cause of all things. The greatest truths of Nature were not discovered by orators, preachers, politicians, debating societies, writers, or critics, nor usually by committees, but mostly by solitary individuals, employing observation, experiment, calculation, meditation, and processes of reasoning. Committees cannot adapt themselves to the frequently varying course of original research, nor can discussion be a substitute for experiment or observation. Most of the great truths of science are based upon the evidence of inanimate substances, the so-called "base earthy matter," which, unlike men, are unbiassed, infallible, and incorruptible witnesses. "Sir Isaac Newton's personality could not affect the law of gravitation" (*The Open Court*, No. 149, p. 2363). By means of research we are gradually led towards the most commanding view and source of all truth, though we do not completely attain it; some of the greatest truths have been discovered by investigating the smallest phenomena. The most fundamental form of original scientific work is not the accurate measurement of known facts or constants, but that of discovering the facts themselves.

Sound and extensive information is usually indispensable to successful research; but notwithstanding that knowledge of sound principles is of the greatest importance to a scientific man, new truths are not unfrequently evolved by beginners, not because they are beginners, but partly because they come to the subjects with unprejudiced minds. It is astonishing in some cases what great truths have been suspected long in advance of the age, by lovers of truth meditating deeply with unfettered minds upon the limited knowledge of the time; an example of this is shown in the case of

Lucretius and his atomic theory; Descartes and his universal ether, and in Pope's "Essay on Man" (see p. 146).

"Truth is a great stronghold, barred and fortified by God and Nature; and diligence is properly the understanding's laying siege to it; so that, as in a kind of warfare, it must be perpetually upon the watch, observing all the avenues and passes to it, and accordingly makes its approaches. Sometimes it thinks it gains a point; and presently again it finds itself baffled and beaten off, yet still it renews the onset, attacks the difficulty afresh, plants this reasoning, and that argument, this consequence, and that distinction, like so many intellectual batteries, till at length it forces a way and passage into the obstinate inclosed truth that so long withstood and defied all its assaults. . . . Truth, like a stately dame, will not be seen, nor show herself at the first visit, nor match with the understanding upon an ordinary courtship or address. Long and tedious attendances must be given, and the hardest fatigues endured and digested; nor did ever the most pregnant wit in the world bring forth anything great, lasting, and considerable, without some pain and travail, some pangs and throes before the delivery" (South, Sermons). "It is so much easier to make a pilgrimage, or endure a long fast, than to subdue and tame the animal nature till it becomes obedient to the rational will, and seconds instead of resisting its wishes, that it is not surprising that in all ages a religion of outward observance should be more popular than one of inward purification" ("Christian Sects in the Nineteenth Century," 1846, p. 133); or than the personal labour and sacrifice necessary to arrive at new truth.

The love of abstract truth is very weak in most men. Many persons think that profound scientific researches have nothing to do with their own particular occupations, but this is not correct; new truth is indispensable to human welfare and progress in all directions; if Brandt had not discovered phosphorus and Cronstedt had not found nickel there could not have been any uses for or manufactures of those substances or their compounds, nor any invention of phosphorus matches. Without scientific discovery there could be no scientific invention, no patents, and no patent agents. If scientific knowledge had not been discovered there would have been none to be taught, or be converted into manufactures or trades by inventors and capitalists; if electric currents and Hertzian waves had not been found, electric telegraphing with wires and without them could not have been invented. Science is not a mere *promised* heaven, but a real one, thus through the medium of the steam-engine and its accessories, it has virtually said to the labouring man, "Come unto me all ye that labour and are heavy laden, and I will give you rest," and its promise has been faithfully and abundantly kept. Promotion of scientific research is older than some persons suppose; Alexander the Great, 300 B.C., presented to his former tutor, Aristotle, the immense sum of 800 talents, equal to nearly £200,000, to aid him in his scientific researches in natural history (Cooper, "Biographical Dictionary," 1873, p. 30).

Great scientific truths are eminently practical, though there are many

persons, especially commercial men, who cannot readily perceive this; what they usually consider the most practical is, that which will bring in plenty of money at once, not that which really does the greatest good to themselves and mankind "in the long run." Comprehensive scientific truths, however difficult they may be to explain or understand, are incomparably more practical than small technical details by which a man may quickly obtain money. There is probably no truth by which mankind have been so greatly benefited as that of universal causation, because the knowledge of it has imparted to all intelligent persons confidence in the certainty of all natural actions, the safety of this globe and its inhabitants, etc. And with regard to the commercial applications of great scientific principles, the whole surface of the world is rapidly becoming covered with them, and they are now so numerous that they hardly need to be mentioned; there is scarcely a single spot on the earth, upon land or sea, to which railways, steamships, telegraphs, lucifer matches, electric lighting, photography, etc., etc., have not penetrated. Such truths, through the medium of inventions which could not have been made without them, have also afforded constant employment in a great variety of ways to tens of millions of workpeople; and the amount of such employment is rapidly increasing. We must therefore abandon the ignorant notion that the great truths of science are not practical because they are in some cases not easily understood or do not at once yield money.

Truth cannot do much good unless it is widely diffused; the great truths of science are cosmopolitan, and all men who will take the trouble to learn are entitled to know them; next in importance therefore to the discovery of truth is its wide publication. For the successful dissemination of truth, two things are necessary:—first, that the speaker or writer must understand his subject, and put it in as simple a form as its nature will admit; and second, that his hearers must possess sufficient preparatory knowledge to enable them to understand it. In a great many cases the hearers or readers are unprepared, and blame the speaker for not having put the matter in a simple form whilst the real defect is in themselves; but ordinary persons often have not time for such preparation, and this is one of the circumstances which retard and regulate the rate of civilisation. Advanced men of science are usually a century or more ahead of the public in knowledge.

It is a glorious circumstance for mankind that human progress and civilisation have their origin in the discovery and diffusion of truth, because it not only promises but actually gives to men a sure reward of happiness on earth in return for the real self-sacrifice and labour of personal improvement. Scientific men have rendered an immense service to mankind by demonstrating the great success which attends intelligent confidence in great natural powers and laws, and the fallacious results attending ignorant faith in unprovable assertions; it is not dogma therefore, but demonstration, which is "divine." In dogmatic subjects unprovable assertions can be made, and untruths told with comparative impunity, because few

persons know how to logically disprove them, but in scientific ones men must be more careful, because falsehood and error are more quickly detected and exposed.

Research for truth in any subject, whether scientific, literary, historical, or theological, is a less usual form of ability than that of popular exposition, eloquence, or success in acquiring money. Where there is one man who discovers truth there are ten who publicly speak, and who find that occupation much less unremunerative, and less requiring them to be truthful in their statements. Whilst in pure scientific research, money is sacrificed to the attainment of truth; in trade, accuracy is extensively sacrificed to the acquisition of money; whilst truth is the motto and idol of the man of pure science, pecuniary success is usually the leading idea of those who engage in manufactures, commerce, professions, or trade; and it makes no very great difference whether the trade, etc., be in business commodities, professional services, trading in knowledge, education, the cure of human bodies, or the "saving of souls."

That both politics and history are often unreliable is well-known. "Political truth is a delusion and a snare" (Dr. MacGregor, M.P.). Politicians appear to be usually guided more by expediency than by great fundamental truths, and the explanation is, that expediency is better suited to the occasion. History is largely "a chronicle of crimes"; and it is often uncertain, because it cannot be repeated or verified; when Sir Robert Walpole was asked what he would have read to him, he replied, "Not history, for I know that to be false." Charles Kingsley is stated to have given up his chair of Modern History, because he said he considered history "largely a lie." Napoleon termed it a fable agreed upon. Dumas called it left-handed truth. It is said that Raleigh, having failed in an endeavour to ascertain the rights of a quarrel that fell out beneath his window, exclaimed against his own folly in endeavouring to write the true history of the world. But this very anecdote has been doubted, and so casts another shadow upon the credulity of accepted statements. A similar story is told of Leopold von Ranke. While collecting facts for his history, a singular accident occurred in his native town. A bridge broke down and some persons were swept away by the river. Von Ranke inquired into the details of the catastrophe. "I saw the bridge fall," said one of the neighbours; "a heavy cart had just passed over it and weakened it. Two men were on it when it fell, and a soldier on a white horse." "I saw it fall," declared another, "but the cart had passed over it two hours previous. The foot-passengers were children, and the rider was a civilian on a black horse." "Now," argued Von Ranke, "if it is impossible to learn the truth about an incident which happened at broad noonday, only twenty-four hours ago, how can I declare any fact to be certain which is shrouded in the darkness of ten centuries?" (W. S. Walsh, "Handy-Book of Literary Curiosities," 1894, p. 461). A multitude of instances might be quoted to prove that historical statements are commonly less reliable than scientific ones, because the latter can usually be verified

when desired, whilst the former cannot happen again. Reliable history does not extend back earlier than about 800 years B.C. (Büchner, "Man in the Past," 1872, p. 43). The histories of the actions, sayings, parables, and opinions of the founders of sects are necessarily very unreliable, because no person can tell with certainty what a man, who made a parable, etc., ages ago, exactly meant by his language, and because sects greatly exaggerate the good sayings and doings of their founders. Science makes contemporary history continually more truthful by enabling us to secure more correct and accurate representations of it; thus we can now hand down to our descendants not only the true features of persons by the aid of photography, but also exact repetitions of their very voices and movements by means of the phonograph and kinematograph. It is, however, often very difficult to be accurate even in science.

There is considerable room for moral improvement in literature; thus, Mr. R. Buchanan, a literary writer, says, "Literature is the poorest and least satisfactory of all the professions; I will go even farther and affirm that it is one of the least ennobling. With a fairly extensive knowledge of the writers of my own period, I can honestly say that I have scarcely met with one individual who has not deteriorated morally in the pursuit of literary fame. For complete literary success among contemporaries, it is imperative that a man should either have no real opinions, or be able to conceal such as he possesses; that he should have one eye on the market and the other on the public journals; that he should humbug himself with the delusion that bookwriting is the highest work in the universe; and that he should regulate his like and dislikes by one law—that of expediency. If his nature is in arms against anything that is rotten in society or in literature itself, he must be silent. Above all, he must lay this solemn truth to heart, that when the world speaks well of him, the world will demand the price of praise, and that price will probably be his living soul" (*Review of Reviews*, May, 1893, p. 515). "It generally happens that when danger attends the discovery and profession of truth, the prudent are silent, the multitude believe, and impostors triumph" (Mosheim). In a less degree are popular scientific lecturers similarly situated to literary ones, but teachers of religion are much more so.

The greatest hindrances to reception of truth are ignorance and selfish desire; but in the most comprehensive scientific aspect these are the natural and necessary retarders of human progress. There has always existed, and still practically exists, great opposition to the reception of new truth; and the chief cause of this opposition is the almost universal desire for immediate enjoyment and ease. "The secret longings that arise which the world never satisfies" (Longfellow). Enjoyment comes before all things with nearly all persons; but the most proper method of obtaining it, viz., by doing the greatest good, is often neglected. Even in the most civilised nations nearly every person prefers that which yields pleasant gratification to that which yields solid truth and the greatest permanent good, because animal delights, sensual amusements, flattering untruths,

great expectations, and illusory promises of happiness, excite more gratifying sensations :—

> " Of a truth it makes one laugh
> To see men leaving the golden grain
> To gather in piles the pitiful chaff."
> —*Longfellow.*

A second cause of hindrance is intellectual indolence and indifference, and this occurs frequently with old persons more than with young ones, because the latter are often compelled to learn a certain amount of new scientific knowledge in order to secure an income. Many elderly persons dislike the labour of improving their minds, largely because they are unable to change their old ideas for new ones. There is a natural repugnance also of unscientific minds to accept either great truths or new ones, because it strains their intellects; very few men can understand important, complex, or profound truths, because it usually requires too much knowledge and attention. Another powerful hindrance is the fear of upsetting theological beliefs ; and to many persons the pure truth of science is painful, because it contradicts some of their most cherished ideas. Another reason why many unscientific persons dislike truth is because it exposes their defects; they prefer advocates and defenders rather than truthful and candid instructors. Many persons will not purchase truth, but only favourable opinion ; for instance, patients frequently will not consult medical men, who carefully point out to them the errors they commit with regard to eating, drinking, exercise, etc. Untrained persons frequently prefer to remain ignorant lest the truth may be unpalatable to them. All the foregoing facts illustrate the paramount influence of the great energies of Nature and of the principle of universal causation acting through animal desire over the reception of truth and the progress of civilisation.

It is not sufficiently recognised by persons generally that new truth is the original source of all human progress, and that without it mankind would have been at the present time in a state of barbarism, like that of the ancient Britons or the present tribes of American Indians. If there was no new knowledge discovered there would be none to be taught or used. Although a very large number of new truths are evolved from old ones by means of study, the variety thus obtainable is not infinite, because the number of old ones is limited ; unless, therefore, new additions to our stock of truths are continually made, all human improvement based upon them would ultimately cease. Scientific investigators discover new truths, inventors use them, and manufacturers, patent-agents, and traders, get money by means of the inventions. It is not generally known that the most clever inventors habitually resort to the published researches of discoverers, to find knowledge to aid them in their inventions. It necessarily follows from these facts that original scientific research is a great human necessity.

Truth is indispensable to human existence ; there are multitudes of

cases in ordinary life in which new truths are urgently required; for instance, knowledge of a means of preventing and of curing cancer, and numerous other diseases. The varieties of pains, sufferings, and reasonable wants of mankind, waiting to be prevented, alleviated, or satisfied, are almost unlimited; a mere list of them would fill a volume (see "The Scientific Basis of National Progress," 1882, pp. 70, 74). In all directions persons are wanting new contrivances and inventions, to enable them to satisfy their necessities and desires, but many of these cannot be obtained until the truths upon which they must be based are discovered; and any attempt to use or diffuse knowledge by means of teaching, etc., without first discovering it, is like trying to relieve a famine without first obtaining provisions. Notwithstanding these facts, and that original research is far more difficult than teaching, the pecuniary aid given to the former is far less than to the latter, partly because the results of teaching appear more quickly, and are much more easily understood. Usually a philanthropist, not fully understanding the nature of original scientific work, would rather give to a college a thousand pounds to aid the diffusion of knowledge, than give ten pounds towards defraying the cost of discovering new truth; from a similar cause, many persons expect to be able to purchase new truth as if it was an ordinary commercial commodity. But men are beggars of Nature, and beggars cannot be choosers; we have no alternative but to discover new truth before we can use it. Similar to treating diamonds as if they were mere glass imitations, new truths, which have cost great thought and labour to obtain, are treated by unscientific persons like common ones which can be obtained by the mere trouble of reading.

The ideas of many persons respecting the conditions and methods of discovering new truth are very peculiar; they think that a scientific man suddenly conceives a brilliant idea, at once tests it by a single conclusive experiment, finds his expectation immediately confirmed, and is highly delighted with the result. Instead of this, however, the idea is usually a consequence of repeated, prolonged, and deep meditation; the method of testing it is a result of further extensive thought; the process of investigating it not unfrequently requires years of constant experiment, calculation, and study, in order to eliminate all errors; and the final attainment of success in nearly all important cases is so extremely slow, that it cannot possibly be attended by great pleasurable excitement; the usual effect of the final proof of an important discovery upon the mind of its discoverer is quiet satisfaction, not excited pleasure. The pleasure of original research is usually less in the performance than in the cessation of it, and consists of relief from great strain. A man whose motive is wholly pleasure would fail as a discoverer because there is so much difficulty attending it, and he who only works for fame would fail in important cases, because fame chiefly comes only after death. "According to the popular notion, the genius learns without study, and knows without learning. He is eloquent without preparation; exact without

calculation; and profound without reflection. While ordinary men toil for knowledge by reading, by comparison, by minute research, he is supposed to receive it as the mind receives dreams" (H. W. Beecher); similarly, eminent scientific investigators are vulgarly supposed to make their discoveries by some mysterious, easy process. Ordinary persons have very fallacious ideas of the easiness with which such men as Newton, Faraday, Oersted, Darwin, and others made their chief discoveries; but the late Dr. Bence Jones, the intimate friend and biographer of Faraday, informed me that it was incredible what a very large amount of original work was performed by Faraday which will never be known to the world, because it was followed by only imperfect preliminary results unfit for publication; every original experimental investigator can testify to similar experiences.

The simple fact that a man makes scientific researches is supposed by many unscientific persons to prove that his time is of but little value, that he has plenty of it to spare, and that he has a superfluity of money, otherwise he would not spend it in such a manner; but usually the very opposite is the truth, because the great majority of investigators are persons who have to earn their livings. The fact of a man doing such work is vulgarly supposed to prove that he must derive great personal advantage in some mysterious way from it, and that if he did not there would be no motive to induce him to do it. It does not seem to occur to such tradesman-like critics:—first, that the work is indispensable to the welfare of mankind, and must be done by somebody; or second, that if the doing of it was wholly dependent upon selfish personal motives, and not largely upon altruistic ones it would never be done at all, and the progress of mankind in civilisation would gradually cease through want of new knowledge; various nations who have neglected scientific knowledge and research are now decaying.

The deficiency of knowledge exhibited even by persons who are highly intelligent in ordinary subjects, respecting the real character of experimental research in important questions, is very great. Nearly all original work, whether in writing, experimenting, observing, or meditating, requires extensive knowledge, considerable mental energy, industry, and perseverance. Original thought, even without experiments, occupies much time, because original ideas do not come at command like common ones, but have to be waited for. Original scientific work is often nearly unnoticed during many years, yields no direct pecuniary remuneration, and usually but little influence, power, or fame, during the discoverer's lifetime; and in cases where it appears to do so, the influence, power, or fame, is usually not much due to the real scientific value of the work, but either to some trivial invention or circumstance attending it which catches public attention, or causes publicity of the discoverer's name, *i.e.*, he obtains credit, not because his original work is clearly understood, but because he is a public man. Even the comparatively small matter of inventing and perfecting the bicycle, with pecuniary gain as the motive, has required the thought and

labour of thousands of persons during a number of years; and the labour and cost of perfecting the steam-engine has been enormous:

> "When anything is done
> People see not the patient doing of it,
> Nor think how great would be the loss to man
> If it had not been done."
>
> —*Longfellow.*

It is evident from these various facts and considerations that the ordinary motives of personal profit or pleasure, which actuate most men and yield success in common occupations, are not largely present in abstruse original research, and cannot much sustain scientific men in such labour. The only motive which exercises a sufficiently constant sustaining power in such cases is a cultivated sense of duty to do the greatest good. The existence of this motive is usually unnoticed, or even disbelieved by those who have made money their chief object, and a lower one is attributed, and this agrees with the well-known fact that those who habitually act from narrow personal motives cannot usually understand or appreciate those who act from more comprehensive altruistic ones.

That the evolution of new truth is costly, either in time or money, is abundantly proved by the experience of all who have engaged in it. For instance, John Hunter, the now celebrated anatomist, is stated to have expended in connection with his anatomical experiments no less than seventy thousand pounds in money, besides an immense amount of time and personal labour. The now immortal Harvey, who made the great discovery of the circulation of the blood, lost nearly the whole of his medical practice through its becoming known that he pursued original scientific research. Plenty of other similar examples might be quoted.

Various attempts have been made at different times to render pecuniary aid towards defraying the expenses of original experimental research, but none have been attended with complete success; and the more original the research the greater usually is the difficulty of assisting it. In some cases in which such assistance has been accepted, double, and in others more than treble, the amount in value of time and labour has had to be spent in consequence of the originality, difficulty, and tediousness of the work. As no man can tell beforehand exactly what he will be able to find, or what the amount of expenditure will be, in testing highly original questions, the acceptance of pecuniary grants in advance is a serious responsibility, and it has been found in some cases a much smaller risk of character and loss of individual freedom to personally earn the money wherewith to defray the cost than to accept the aid under the conditions which have been found necessary in order to prevent abuse; and this partly explains the fact that some original workers have held aloof from such grants, and have termed them "white elephants." In many cases, however, the grants have been of great service, especially to young men, in promoting the discovery of less original kinds of new truth; and in many others the investigators

themselves have defrayed the expenses by combining the occupations of some trade or profession with that of discovery. The kinds of occupation which best harmonise with the pursuit appear to be those of teaching science, and consulting and expert science.

As the first rule to obey in searching for new truth is to "follow where Nature leads," the condition of freedom in examining abstruse questions is quite as important as that of pecuniary assistance; and it is evident that if the investigator is fettered by the ideas of other persons, or directed to follow a certain course or make some particular discovery, or make reports of his progress, he cannot proceed at all or discover anything of importance; the variety and number of obstacles also are so great that the least addition to them often stops the inquiry. These remarks apply more strictly to abstruse and highly original researches, because the greater the degree of originality of the investigator and of the research, the less will they bear restriction; and in such cases the only successful method is to provide the worker with means and leave him entirely alone. Probably the least unsatisfactory way of rendering pecuniary assistance to the most original workers would be for the most competent scientific authority to spontaneously give money as a recognition of research which has been recently done instead of to be done, and to give it, not as payment of any claim, but as help towards defraying costs already incurred. This method would prevent improper claims being made, and by it the investigator would not only be provided with means of further research in case he may be able to make it, but he would not be fettered by any restrictions or rules of committees, nor by future responsibility in any way. It has been largely because such aid has been attempted to be made too much on "business principles," and fettered by outside guidance and restrictions in order to prevent abuse, that the promotion of the most original kinds of scientific research by pecuniary aid has not been more successful. The degree of speculative character of research, similarly to that of commercial undertakings, varies greatly in different cases; and is usually greatest in the most important questions.

The discovery of important new truths cannot in the present imperfect state of civilisation be largely carried on upon ordinary trade rules, because it is so much in advance of the time, and because its results are too uncertain; the tradesman will not usually aid such research unless he knows what the result will be, and this it is often impossible to inform him. The chief objects of trading and of scientific discovery are widely different; the one is money, and the other is new knowledge. The pursuit of truth is essentially much more comprehensive than that of money, and cannot from its very nature be secondary to it; a scientific man usually pursues the two together, and that method yields the greatest happiness to himself and to all.

The pursuit of money and of truth is each good in its own way; if there were no traders there would be no provision for supplying immediate needs, and if there were no discoverers there would be none for developing

general improvement. By the pressure of advance of civilisation, even men of business will before long be compelled to directly pay for original research; indeed this has already commenced by the employment at reasonable salaries ("£200 to £500 a year") of numerous chemical investigators in the great dye-works of Germany, solely for the purpose of discovering new chemical compounds, to be converted by means of invention into saleable commercial commodities in the form of new dyes, new medicines, etc.

In consequence of the foregoing and various other hindrances to the discovery of new truths, it often requires a long time, in some cases hundreds of years, for truth to overcome prejudice and error, for instance, it took more than a hundred years to firmly establish the Copernican theory of the heavenly bodies. This slowness of effect agrees with the law of inertia, and is directly proportionate to the mass of opposition to overcome; it is one of the ways in which the great energies of Nature operate through mankind so as to regulate the rate of human progress; and although the phenomena through which the universal principle of inertia operates are very complex, the rate of the effect is no doubt as certain and definite as that of the revolution of this world in its orbit. The whole of the circumstances connected with the discovery of truth show that it is subject like all other human actions to scientific laws and principles.

A great problem, ever pressing upon mankind
Is how to discover and apply
The immense Universe of Unknown Truth;
Thus to understand the Great Cause of all things,
And harmonise our actions to it. And thus
The final aim and end of all new knowledge
Is the improvement and perfection of mankind.

"Ring out the old, ring in the new;
Ring out the false, ring in the true."
—*Tennyson.*

56. Error in General.

"Ignorance is the parent of error."
—*Dante.*

Error is extremely prevalent; wherever ignorance is there also is error; directly we enter into the subject we find that it is almost interminable; and that, whilst in every single case there are many ways of going wrong, there is usually only one of going right, and many wrong explanations, but usually only a single true one in any question. The daily newspapers are largely filled with accounts of crimes, accidents, and other human mistakes, in the greatest possible variety; there further exist multitudes of other errors of which we never hear; and even those of a single family are

manifold. The mistakes of mankind are so extremely numerous that a simple description of them in all their varieties would fill a volume ; only a few examples will therefore be given in this section. The occupation of examining them is a very thankless one, and more harm than good would probably be done by entering far into the subject unless useful explanations or available remedies could be suggested. Most persons prefer to attack error rather than build up truth, but we should not destroy that which is imperfect until we have provided something better to take its place ; it is better to build up truth, compare it with error, and then take our choice, and that is the method constantly employed by scientific men. A large proportion of mankind, intelligent in many subjects, are in the mental condition of heathen with regard to some questions ; and the emancipation of the human race from mental error is incomparably more important than was the bodily emancipation of the West Indian and American slaves.

> " Errors, like straws, upon the surface flow ;
> He who would search for pearls must dive below."
>
> —*Dryden.*

Quite a multitude of errors arise through individuals thinking too much about themselves, and this itself is often due to ill-training during childhood, and to neglect of better occupation; every man must have employment both for his body and brain, and if he is not occupied with superior matters he will be with inferior ones. Much thinking about himself makes him conceited, unless it be with a constant sense of personal deficiency and an incessant determination to improve. Ignorant conceit is a common cause of ultimate failure in life ; conceited persons are often dissatisfied and complaining ones, and, instead of feeling reasonably contented with what they possess, they are continually dwelling upon the failures they experience and the imaginary wrongs they endure ; and they usually have but feeble perception of the duty of working to assist general progress. Many persons are very much like spoiled children, they erroneously expect that things which are essentially and incomparably more important than themselves shall be sacrificed or set aside for their gratification ; they behave and talk as if great terrestrial phenomena, such as droughts, failure of harvest, etc., should not occur. Some even believe that the sun, with its enormous mass and immense velocity, might be suddenly stayed in its course in order to serve some merely human object, not knowing that if it were it would be instantly converted into vapour, and all terrestrial plants and animals consumed by the amazing heat produced by its sudden cessation of motion. Others, that the course of Nature in the downfall of rain should be altered in reply to their prayers, as if the interests of some local community or some selfish persons were more important than the maintenance unbroken of the laws of the universe. Whilst the scientific man trusts in a rod of copper to preserve himself from lightning, and in

dynamite and steam-excavators to "remove mountains," the sectarian professes to trust in the easier method of prayer. The great energies of Nature always act in accordance with law, and in a perfectly equitable manner towards all living creatures; they never sacrifice the greater to the less, they take no notice of the complaints of the ignorant, nor of the prayers of the pious; they warn man in painful terms of his self-conceit, and bid him take his cue from his punishment, acquire suitable knowledge, and become better prepared for the future. Men, however, notwithstanding that they are incessantly warned, continue to act as their ideas and environments compel them, and only diminish in conceit with increase of knowledge, and at a rate determined by their internal and external circumstances. The idea that a mere human being, incomparably less than a mere microscopic speck in the universe, a 120,000 million million millionth part (100 million millions × 1,200 millions) of this world, (the world itself being a mere speck in the entire visible universe of stars), should be able to persuade infinite and omnipotent power to alter its course for his special benefit is a sublimely ridiculous error :—

> "Think we, like some weak prince, the Eternal cause
> Prone for his fav'rites to reverse his laws?"
>
> —*Pope.*

Covetous desire is not yet eradicated nor is it likely to be; multitudes of persons will continue to waste a large portion of their lives in wishing, instead of qualifying themselves for doing good. A recent writer says :— "It is a grave charge to bring against Christianity that it encourages selfishness." . . . "Others besides myself believe this to be the case with Christianity as taught in churches" (F. Govatt, "The Pains of Life," 1889, p. 162). . . . "The whole tendency of the teaching was to fix men's minds far more intensely upon the future than upon the present; and . . . its cardinal principle in regard to the future was the selfish attainment of everlasting bliss" (*ibid.* quotation, Lawrence Oliphant, "Scientific Religion"). All of us, however, must believe much that we desire; the human brain must be active; blood will flow through it and revive its impressions; and we are compelled to wait for more truthful ideas to be discovered; hence arises the necessity for a whole army of purveyors of false ideas in nearly all branches of knowledge and belief; men continue to believe falsehoods as they ever did, but the falsehoods are of a less dangerous kind than formerly. "It is a profound psychological mistake to assert that whenever we can form clear ideas, not in themselves contradictory, these ideas must of necessity represent truths of Nature" (G. H. Lewes, "Aristotle," §§ 69, 69a, 108); this mistake arises from the fact that there is a limited degree of consistency of error whilst there is universal consistency of truth, and mankind can more easily perceive the former than the latter.

It is a particular kind of error, arising from ignorance of great scientific truths, which induces multitudes of persons to fixedly believe in erroneous statements, without proper and sufficient evidence; for instance :—

According to Christian doctrine, "all things are possible to him that believeth" (St. Mark, chap. ix, verse 33);—"if ye have faith as a single grain of mustard seed, ye shall say unto this mountain, Remove hence to yonder place; and it shall remove; and nothing shall be impossible unto you" (St. Matthew, chap. xvii, verse 20, revised edition); these statements are however flatly contradicted by abundance of proper evidence, and if it were not a fact that the human brain is capable of receiving the most erroneous impressions, it would be a great mystery that any person in his senses could be found to believe such assertions. If unsuspecting persons of good intentions could only realise the danger they incur of acquiring a habit of untruthfulness, and the seriously "evil" effects to mankind which result from faith in unprovable beliefs, they would less readily accept them. In matters of theological doctrine, mankind still live to a great extent in a kind of "fool's paradise." According to Bossuet, "the greatest sign of an ill-regulated mind is to believe things because you wish them to be so." If we compare the above promises and their lack of verification with the predictions and performances of science in multitudes of cases, the contrast is very striking. "Sorrow will not endure sophism if the latter is perceived." It is not entirely inconsistent with the doctrine of faith in unprovable dogmas to say with Tertullian, "I believe it, because it is impossible":—

> "Oh, to how many Faith has been
> No evidence of things unseen."
>
> —*Longfellow.*

But false as a deceptive dream.

Every subject of human study is liable to a very large class of errors arising from our extremely limited knowledge; and in very few subjects is the number of our errors so numerous as in that of mental and moral science. Every different subject of study has also its own peculiar class of fallacies which require to be guarded against. Mental and moral phenomena are particularly liable to errors arising from the circumstance that they are both abstruse and complex, and that the phenomena to be observed and the observing faculty are intimately related, the one frequently disturbing the other; thus when two mental actions are very closely allied, as when attention is directed to the act of volition (which is itself an act of attention), or when consciousness attempts to observe consciousness, the attempt is largely a failure, because the two actions, observing and being observed, cannot coexist in the same cerebral structure.

Consciousness, when uncorrected by knowledge and inference, is a great source of error. That which we feel, we usually think exists whether it does or not. The almost incessant and irresistible obtrusion of consciousness exercises more or less dominion over every mind, and disturbs nearly every train of thought. It unobservedly influences to a large extent

our idea of man's position in Nature. It causes us to think that we are much more important than we are, that an occult "spirit" exists within us which is independent of our material structure, and it largely produces the idea that that "spirit" will be active forever after our material structure has entirely decayed; and this idea, by combining with our desire for more perfect enjoyment, largely originates the still more complex one of everlasting happiness after death, and consequently leads to an idea of the necessity of a heaven, and a large number of contingent unprovable notions, to complete the imaginary picture :—

> "You're ever building, building to the clouds,
> Still building higher, and still higher building,
> And ne'er reflect, that the poor narrow basis
> Cannot sustain the giddy tottering column."
>
> —*Wallenstein.*

We are compelled by the properties of our nervous system to largely perceive the things and actions around us as well as some of the changes within us, and we can only to a limited extent prevent the actions of our perceptive faculties. We often cannot avoid being deceived by our senses, or by our powers of comparison and inference, and no person is able to observe, compare, or reason correctly in all cases. In order to avoid error, all our lower faculties therefore require to be regulated and corrected by the higher ones; the bodily powers by the senses, the senses by comparison and reason, with the aid of the fullest evidence; or more accurately, the simpler powers by the complex ones; but even if these rules are obeyed, as our knowledge is extremely limited, we would still commit many mistakes. As reason is the faculty by means of which we distinguish truth from falsehood, any deficiency of knowledge permits a whole host of errors to be committed by it. But even by taking the very greatest care we only prevent some of our errors. "The amazing delusions of our forefathers were largely founded on erroneous premises; modern fallacies arise chiefly from erroneous conclusions; in other words, science has corrected our data of general knowledge, but has failed to train the masses in the logical use of those data" (*The Open Court*, No. 211, p. 2939). "The soft-headed fool believes all that he hears; the hard-headed fool refuses all testimony but his own; he believes nothing outside his own experience" (*ibid.*, No. 25, p. 715). Every erroneous idea is more or less an irrational one; it is quite as irrational to believe respecting a human being who died two thousand years ago "I know that my Redeemer liveth," as to believe that fire will not burn, nevertheless there are multitudes of persons who fixedly do so, and the chief justification of such conduct is that we are compelled to believe that which is false as well as that which is true if it is repeatedly impressed upon us; the "immorality" also, in the ordinary sense of the word, of unprovable theological doctrines, is shown by the innumerable crimes to which they have led, and are still leading, as in the case of the "Armenian atrocities," and by the grave public dangers which

arise from the neglect of moral and secular instruction in order to teach such doctrines. Fixity of cerebral impressions makes the vitality of error enormous; to fixedly believe important unprovable assertions is not the way to "save the human soul" but to injure it.

Contradictories cannot coexist; hence pre-occupation of the mind by an untruthful idea produces prejudice, and prevents the reception of an opposite true one. "All prejudice, which disqualifies an individual from comparing evidence, is so far disorder of intellect. In madness the prejudice and perversion are more decided, and for the most part more honest than those which cause divisions amongst responsible men" (G. Moore, M.D., "The Power of the Soul over the Body," 1846, pp. 149, 150). Largely through ignorance every nation, like each individual, sees only one side of the question affecting itself; thus in a Christian country we hear only of the good qualities of Christianity and but little of its defects or of the virtues of other forms of religion; in a Mahommedan one we hear similarly respecting that form of religion; and similarly in other cases. The reception of truth or of error is often a question of conflict of ideas; when truth is unpleasant, mankind will, in many cases, try every possible form of error before they will accept it; this is shown by the opposition to science by sectarians, they persist to the last in cherishing their fond desires and unprovable beliefs; similarly with scientific men and error, they cannot receive the contradictory ideas of theologians.

It does not invariably follow that because a man is free from error in one subject that he is equally free in another, for instance, he may understand history, literature, theology, or technical science, and yet not know the essential rules of morality, nor fully realise the certainty of punishment following their infraction; men often do immoral acts in spite of their piety or special knowledge. He who can apply the chief principles of science to explain common events and circumstances can perceive great truths to which most men's minds are blind; thus the astronomer can beforehand see coming celestial events which to unscientific minds are quite unknown. "Some have eyes that see not," and walk this sacred globe from birth to death, and never more than vaguely think of the existence of the universal energies, by which and in which they live and move and all things have their being.

"Three causes especially have excited the discontent of mankind; and by impelling us to seek for remedies for the irremediable have bewildered us in a maze of madness and error. These are death, toil, and ignorance of the future—the doom of man upon this sphere, and for which he shows his antipathy by his love of life, his longing for abundance, and his craving curiosity to pierce the secrets of the days to come. The first has led many to imagine that they might find means to avoid death, or failing in this, that they might, nevertheless, so prolong existence as to reckon it by centuries instead of units. From this sprung the search, so long continued and still pursued, for the *elixir vitæ* or *water of life*. From the second

sprang the search for the philosopher's stone, which was to create plenty by changing all metals into gold; and from the third, the false sciences of astrology, divination, and their divisions of necromancy, chiromancy, augury, with all their trains of signs, portents, and omens" (C. Mackay, "Extraordinary Popular Delusions," 1852, vol. i, p. 94). From the false sciences of astrology sprung the true one of astronomy; from the mystical one of alchemy arose the real one of chemistry; the search for perpetual motion promoted the science of mechanics, etc., from false beliefs and creeds arise truer ones; and are now arising scientific morality and scientific religion. "History teems with delusions, and neither talent nor integrity, piety nor single-mindedness, religion nor law, nor all of them combined, have proved a safeguard against them" (E. C. Brewer, "Dictionary of Miracles," 1884, p. xiv).

The love of error rather than of truth is as old as man; nearly all mankind have loved it the most if it appeared to be more gratifying to them; thus the prophet Jeremiah spoke of his time in those remarkable words:—"The prophets prophesy falsely, the priests rule by their means, and the people love it to be so" (A. Alison, "Philosophy of Civilisation," 1860, p. 223). Without digressing much into this matter, it may be remarked that this comprehensive statement is still very largely true, and many persons derive a vast amount of influence by fostering this mental disease instead of attempting to explain or prevent it; both priests and physicians are, in nearly all cases, practically compelled to preach and prescribe palliatives instead of preventives of "evil" in order to satisfy their hearers and patients. The scientific explanation of this is, that all mankind are in a state of evolution, and must do what they are able until they can do better. In some extreme cases a man's life would not be safe if he told "the truth, the whole truth, and nothing but the truth," to some vindictive persons who could not understand it. The entire history of civilisation proves that mankind must wade through error in their progress towards truth, that truth is continually being evolved out of error; and that the habit of believing falsehood in preference to truth can only very slowly diminish. As long ago as about the year 1733, Alexander Pope stated the very comprehensive scientific truth that "whatever is, is right"; yet even now it is but little believed.

Errors decrease with the progress of science and knowledge; many which were generally believed to be true in past times are now commonly known to be false; for instance, belief in satyrs, an animal with the head of a man and the body of a goat; griffin, a beast with the body of a lion and the head of an eagle; men whose heads grew beneath their shoulders; mermaid, half a woman and half a fish; dragon, a serpent with the head, wings, and claws of an eagle; unicorn, a beast with a single straight horn on its forehead; phœnix, a bird that rose to life from its ashes; centaurs, half men and half horses, said to inhabit a part of Thessaly; witches, women who could form compacts with devils; angels of various descriptions with wings, cherubims and seraphims; ministering angels; demons,

or evil spirits, the existence of which are still believed in by many pious persons, and the exorcism of them recently approved by papal authority; formerly it was commonly believed that the atmosphere swarmed with demons, and that multitudes of them entered men's bodies by being swallowed, and caused numerous diseases, some of which we now know to be due to microbes, etc.; belief in the existence of races of men who lived one thousand or even two thousand years; another, that the earth was of the form of a brick, with four great walls to support the sky, that the heavens were several storeys high, with angels on the second storey; that the sun was placed behind a great mountain in the north during the night, and brought out again each morning; that rain was produced by angels opening the windows in the sky; and a multitude of other fallacies which need not even be mentioned. With the ignorant, the stars were "only specks of tinsel fixed in heaven to light the midnight of their native town." "When Park asked the Arabs what became of the sun at night, and whether the sun was always the same, or new each day? they replied that such a question was childish, and entirely beyond the reach of human investigation" (Lubbock, "Fifty Years of Science," 1895, p. 110). Illustrations of some of the above fables are still to be seen in the form of carvings, sculptures, paintings, etc., in a great number of churches, chapels, cathedrals, monasteries, nunneries, abbeys, etc., especially Roman Catholic ones, and fully prove the great tendency of "religious" minds to believe anything which encourages devotional feeling and the selfish desire of a future state. "So have I seen, over the portal of the Cathedral of Freiberg, a representation of the Almighty making and placing numbers of wafer-like suns, moons, and stars; and, at the centre of them, platter-like, and largest of all, the earth" (A. D. White, "Warfare of Science and Theology," 1896, vol. i, p. 3). In the front of the tower of the cathedral at Bath, the figures of angels or persons climbing ladders to heaven are sculptured in the stone. By thus representing untruth in such durable forms, it has been continually impressed upon the brains of children and ignorant persons and perpetuated. As sanitary laws have been enacted for preventing the spread of bodily epidemics and diseases, and the sale of unhealthy fish, meat, poultry, it is probable that the spread of mental disease by the exhibition and sale of injurious mental food will also in due time be inhibited by means of knowledge. Whilst scientific men are constantly endeavouring to make their fellow-men mentally healthy by discovering and diffusing truths, others are making them unhealthy by inventing and diffusing untruths. Bossuet, Bishop of Meaux, declared that "a single devil could turn the earth round as easily as we turn a marble" (*ibid.*, vol. ii, p. 124).

In the ceremonies of some sects are employed at the present time nearly every possible contrivance, artistic and stage methods, resembling the appliances in a theatre; including the influences of motion, sound, light, and odour; the use of music, tinkling of bells, chanting, intonation, coloured lights, artificial "miracles" and "mysteries," "sacred relics," sculptured figures of saints and of bleeding images, bright

objects of metal, large candles, coloured windows, dim "religious light," gilded church furniture, flags, banners, pictures, emblems, crucifixes, monstrances, peculiar vestments, postures, genuflexions, imposing ceremonies, processions, perfumes, burning incense, etc., etc., all of which excite the senses, nerves, and emotions of the worshippers and assist in impressing upon their minds unprovable dogmas as being "absolutely certain knowledge." With the assumed object of "saving mankind," promises of the most attractive kind, with illusions of sense are so combined, pomp and ceremony so designed, truth and untruth intertwined, with art and dogma undefined, to captivate the unwary mind; and these materialistic influences are called "religion." Whether intended to do so or not, these theatrical contrivances have the effect of exciting the lower faculties of the worshippers, and subjugating the higher ones; they divert the mind from the moral duty of inquiring into the truth or fallacy of the doctrines, and thus increase the power of the priests and of the Church over the minds of the worshippers. It is stated that for one of the recent Roman Catholic festivals in the Basilica of St. Peter's at Rome, as many as "eighteen thousand candles were burned during the ceremony." "The men of the people are struck with pompous display, and this the Church of Rome has always aimed at" (Professor G. M. Fiamingo, *The Open Court*, September, 1897, p. 521). "These pompous ceremonies of the Church are but an empty show to him who knows the actors in them" (Longfellow). It was Gibbon who said that the various kinds of religious worship in the Roman world "might be considered by the people as equally true; by the philosopher as equally false; and by the magistrate as equally useful" (Maudsley, "Natural Causes, etc.," 3rd edition, 1897, p. 123). Multitudes of persons attend Christian places of worship, chiefly for a quiet weekly relief from the pressure and noise of business and as a matter of custom, and do not inquire whether the doctrines they hear are true or false; they feel soothed, and that satisfies them.

Sweet odours and ravishing sounds, the latter especially, have great effect upon the feelings and emotions of many nervous and devout persons, and make them imagine that they are experiencing a foretaste of heaven; for instance, the late Cardinal Newman speaks of them as "mysterious stirrings of heart," "strange yearnings," "awful impressions"; and as having "escaped from some higher sphere," as "echoes from our home," "the voices of angels or the magnificat of saints" (see section 55, p. 436). There is probably no more insidious method of instilling error into the human mind than by means of music, because, although it affirms nothing, when it is used in conjunction with figurative or fallacious language, by exciting emotions, imaginations, and desires, it enables false ideas to be excited and fixed upon the brain as true ones. In this way, ideas for which there exist no proper and sufficient evidence are continually being perpetuated on an etxensive scale, in hymns, oratorios, poetry, etc., and the minds of the hearers are thereby unfitted for the reception of great scientific truths.

In consequence of the feebleness of the human mind in relation to the immensity of possible knowledge, self-deception is a frequent accompaniment of intentional honesty; "men exhibit a marvellous facility of deceiving themselves; whilst professing to esteem worldly aims as of little account, as infinitely trivial in comparison with the momentous concerns of the life to come, they at the same time concentrate all their real hopes, aspirations and energies upon the pursuit of them. Thus their nature is an inconsistency, a house divided against itself, a nature whose faith and works are in discord; and how can it stand when trouble comes? A decrease of the amount of insanity in the world would probably take place in a generation or two, if men were to cease to deceive themselves" (Maudsley, "Responsibility in Disease," 1874, p. 291).

The desire to avoid error is not always accompanied by the ability; whilst many theologians have acquired all the minor qualifications which help to make life genial, they have largely omitted to make themselves familiar with the great energies of Nature and the fundamental truths in accordance with which those energies operate and govern mankind; they have sacrificed to unprovable dogmas and "the good of the Church" some of the greatest truths which have ever entered the mind of man; and a result of this has been an incessant conflict between theology and science which has continued during many centuries. Through deficiency of scientific knowledge they have continually halted between truth and error; thus "Cardinal Newman, having thrown out science at the beginning of his book" ("A Grammar of Assent") "on account of the havoc it was making with religious creeds and all kinds of supernaturalism, was obliged to bring it back again at the end, disguised as the 'Illative Sense'" (Crozier, "Civilisation and Progress," 1892, p. 82). The same author adds that notwithstanding the Cardinal's attempt to supersede science as an instrument of attaining the highest truth, he felt no difficulty "in giving full and unqualified assent" to "winking Madonnas, the liquefaction of the blood of St. Januarius, the miraculous cures at Lourdes, and other supernatural inventions of the present day" (*ibid.*, p. 73). The Cardinal's own words are: "I think it impossible to withstand the evidence which is brought for the liquefaction of the blood of St. Januarius at Naples, and for the motion of the eyes of the picture of the Madonna in the Roman states" ("Apologia," p. 298); largely a pitiable admission of a profound thinker without the fixed light of sound scientific principles to guide him; he admits, however, in his "Essays on Miracles," 1885, p. 81, that "enthusiasm, ignorance, and habitual credulity are defects which no number of witnesses removes." His case is only one out of tens of thousands of devout and intentionally honest persons, men of refinement, and of intelligence in other subjects, whose minds have been deflected from the very greatest of truths by preconceived unprovable hypotheses. Such instances show that whilst a man's mind may be perfectly rational on many subjects, it may be erroneous on some of the very greatest; for instance, with regard to the unscientific doctrine of the immaculate con-

ception, "the founder of Rome was said to be the divinely begotten child of a vestal virgin. And in the old Babylonian mysteries a similar parentage was ascribed to the martyred son of Semiramis, gazetted Queen of Heaven" (R. Anderson, "A Doubter's Doubts, etc.," 1894, p. 76). The very fact of a man stating as "true" that for which he knows there is no proper and sufficient evidence, such, for instance, as the alleged conversion of bread and wine into the body and blood of Christ must, if he has much love of truth, lower his confidence in himself, and his character in the opinion of others, scientific persons in particular; it makes him feel guilty of untruth, and I have been distinctly informed by those who have during many years officiated as Christian ministers that this was their experience. It must be painful to conscientious men to preach what they believe to be untrue, but it often has to be done in consequence of the omnipotence of natural energy acting through human environments upon feeble men by the necessity of obtaining an income.

According to W. S. Lilly: "The most feeble and confused intelligence is consistent with the highest sanctity"; *i.e.*, an imbecile can act rightly, even in the most difficult questions of morality and religion. "Things hidden from the wise and prudent are often revealed unto babes" ("Ancient Religion and Modern Thought," 1885, p. 286). These statements are very flattering to ignorant persons, and might be readily believed by them; and it is quite true that some persons have a much stronger desire than others to do what is right, but we have no proper and sufficient evidence to prove that "the highest sanctity," or purest moral conduct, is "revealed" unto "the most feeble and confused" intellects, or to "babes."

"Religion has ever been a synonym of revelation. It never has been a deduction from what we know" (Cardinal Newman, "A Grammar of Assent," 1870, p. 93). "Christianity is a history supernatural" (*ibid.*); and "it is a matter of faith with Catholics that miracles never cease in the Church" (*ibid.*, p. 193). The statement that religion is supernatural revelation has never been proved; and as every new experiment further confirms the universality of natural power and law, it is an error to attribute to revelation or supernatural influence, effects which can be more reasonably explained by natural causes.

In theology, at the present time, instead of truth men are offered mystical imaginings: "In the higher moods of spiritual exaltation the understanding is hushed and the light of sense goes out, paled before the splendour of the invisible world. Thus it was when St. Paul was rapt in ecstasy and—whether in the body or out of the body he could not tell—heard unspeakable words which it is not given to man to utter." "Thus when St. Theresa in the fruition of that intimate union with her Divine Spouse, 'in the centre of the soul, where illusion is impossible,' was instructed by the light which is the life of men, without words or the use of any corporeal faculty, in mysteries 'too sublime to be spoken of in earthly speech, for they are figureless and formless'" (W. S. Lilly, "The Great

Enigma," 1892, p. 287; see also "Life of St. Theresa," translated by D. Lewis; Maudsley, "Natural Causes," 1897, pp. 253-257). "Every great faith in the world was originated by mysticism and by mysticism it lives; for mysticism is what John Wesley called 'heart-religion'" (Lilly, *ibid.*, p. 283); even the learned theologian, Cardinal Newman, believed that "before now saints have raised the dead to life, crossed the sea without vessels, multiplied grain and bread, cured innumerable diseases, and stopped the operations of the laws of the universe in a multitude of ways" (Maudsley, "Natural Causes," 3rd edition, 1897, p. 236). Just like "drowning men catch at a straw" so do some persons seize hold of the smallest portion of scientific knowledge which seems to support their preconceived beliefs; in this way the universal ether and its vibrations are being employed to enforce the view of the existence of myriads of supernatural spirits in space, and the idea of the existence of supernatural beings and phenomena is still tenaciously clung to by a large number of persons. This idea is a necessary result of the influence of natural causes, and will continue until more truthful ones prevail.

Ignorance of the great principles of science results in causing persons to frequently assume erroneous conclusions in the ordinary affairs of life. An instance is related by Herbert Spencer of "a lady who contended that a dress folded up tightly weighed more than when loosely folded, and who, under this belief, had her trunks made large, that she might diminish the charge for freight," and another, "that by stepping lightly she can press less upon the ground, and who asserts that if placed in scales she can make herself lighter by an act of will."

Fluency of speech without the possession of suitable and adequate knowledge is a great temptation to error, and is frequently more of a vice than a virtue; this frequently occurs with juvenile speakers, demagogues, and mob orators, also in pulpits when any subject which requires a sound knowledge of science is being treated; and most astounding assertions are sometimes made. A common error is to state metaphorically things which have never occurred, for instance, that on the crucifixion of Jesus Christ, "the earth was shaken to its centre," etc., and if any corrective remark is made upon such a statement, the excuse is, "it was only a metaphor," as if an untruth in a solemn subject was a matter of no consequence. One seriously evil result of such statements is, that by reiteration of them, falsehoods gradually become fixed beliefs in the minds of unthinking persons and are diffused and perpetuated. The careless use of allegory, myth, and fable is very unscientific. According to one writer "a myth is not a falsehood" ("The Natural Religion," 1896, p. 33); "myth, a work of fiction, a fabulous story" (Worcester's Dictionary). It was "a saying of the first king of Great Britain," that "the tropes and metaphors of the speaker were like the brilliant wild flowers in a field of corn, very pretty, but which did very much hurt the corn" (Sir H. Davy, "Consolations in Travel," 1833, p. 253). "Students of history should be taught that all 'word-paint,' and all equivocal statements must be regarded with suspicion"

(*The Open Court*, No. 25, p. 717). The success of a fluent and unreliable orator is often dependent upon the ignorance of his hearers, and is largely demoralising. Public speaking without sufficient knowledge and wisdom has cut short the attainment of eminence by many young men. With unscientific orators and writers it is often a case of "a horse running away with its rider," and of "a world of talk and nothing said :—

> "Some, who the depths of eloquence have found,
> In that unnavigable stream were drowned."
> —*Dryden.*

One very frequent source of error is too extensive generalisation, *i.e.*, stating explicitly in a conclusion more than is implicitly contained in the premises or evidence. Partly disciplined workers of science and others have often committed this error, and have mistaken both the peroxide of iron and mineral sulphide of iron for metallic gold, magnetic oxide in tea for iron filings, etc. Before knowledge of science had sufficiently advanced, even experienced chemists mistook silica and alumina for the same substance ; similarly with baryta and strontia, sulphur and selenium, sodium and potassium, cæsium and potassium, argon and nitrogen, etc. Under the influence of scientific enthusiasm, and by drawing conclusions from insufficient evidence, more than forty new elementary substances were supposed to have been discovered by different chemists between the years 1770 and 1878 (see "The Art of Scientific Discovery," 1878, p. 135).

A great many errors arise from mistaking appearances for realities, and this is one of the greatest hindrances to progress. Many of our errors arise from defects of the senses ; the eye, for example, cannot accurately determine degrees of brightness, especially of lights of different colour ; nor can the ear exactly determine different intensities of sounds. Similarly, we are unable by the eye, even when aided by the sense of feeling, to detect slight differences of form, magnitude, distance, or smoothness, nor can the hand detect small differences of weight. Our senses also vary greatly in delicacy with our physical state. Some of the impressions made upon our senses last longer than the phenomena which caused them, thus a rapid succession of sparks appear to be a continuous light ; but by means of a revolving mirror the discontinuity may be detected. In every single observation made by the aid of our senses, the element of personal error enters ; in every such instance there may exist a number of causes of error, and it often requires a high degree of scientific training to enable us to detect, prevent, avoid, or make due allowance for this class of errors.

Preconceived ideas are a great source of opposition to the reception of truth ; when prejudiced or undisciplined persons observe phenomena, they are very apt to notice and remember the circumstances which favour their preconceived ideas, and neglect or forget the unfavourable ones ; we

should therefore be cautious in accepting the testimony of an incompetent or prejudiced person. Lord Bacon says, "Men mark when they hit, and never mark when they miss." He also quotes an ancient story of a man who was shown the portraits of a number of persons who had paid their vows before going to sea, and had not been drowned, but who, when asked to acknowledge the power of saints to preserve persons from shipwreck, replied, "Aye, but where are those painted who were drowned after their vows?"

Personal bias or antipathy, or a state of expectation, is very apt to influence us without our perceiving it, and in order to exclude this in chemical analysis, we make what is called a "blind experiment," *i.e.*, we analyse a weighed quantity of the substance, the weight of which is unknown to us until after the analysis is complete, we then compare the total weight of the ingredients we have found with the weight of what we have taken. In other cases the "personal error" has to be eliminated by means of special contrivances which are different in almost every different case; in some cases it is diminished by employing a different observer. Unconscious prejudices are the most insidious ones. Superficial observation is a continual source of error; many errors can only be detected by long-continued, deep, and arduous research; some in the subject of astronomy have required centuries of observation and investigation to disclose them.

Another common error is to claim for the credit of one cause that which is due to another; thus advantages have been ascribed to the use of prayer and to acts of "special providence," which are explicable by natural causes. For instance, Mr. Müller in his "Life of Trust," claimed to have supported his orphanages simply by prayer; but in various ways his doctrine of prayer was extensively made known amongst unscientific and religious persons, exciting their wonder and sympathy, quite sufficient to account for the effect.

Preconceived fixed ideas and hypotheses are fruitful sources of error in science as well as in other subjects; the following is an example given by the late Dr. T. Thomson, and relates to the discovery of the metal palladium—"Chenevix was for several years a most laborious and meritorious chemical experimenter. It is much regretted that he should have been induced, in consequence of the mistake into which he fell respecting palladium, to abandon chemistry altogether. Palladium was originally made known to the public by an anonymous handbill which was circulated in London, announcing that palladium, or new-silver, was on sale at Mrs. Forster's and describing its properties. Chenevix in consequence of the unusual way in which the discovery was announced, naturally considered it as an imposition upon the public. He went to Mrs. Forster's and purchased the whole of the palladium in her possession, and set about examining it, prepossessed with the idea that it was an alloy of two known metals. After a laborious set of experiments, he considered that he had ascertained it to be a compound of platinum and mercury, or an amalgam

of platinum made in a peculiar way, which he describes. The paper was read at a meeting of the Royal Society by Dr. Wollaston, who was secretary, and afterwards published in the *Transactions*. Soon after this publication another anonymous handbill was circulated, offering a considerable price for every grain of palladium made by Mr. Chenevix's process, or by any other process whatever. No person appearing to claim the money thus offered, Dr. Wollaston, about a year after, in a paper read to the Royal Society, acknowledging himself to have been the discoverer of palladium, related the process by which he had obtained it from the solution of crude platina in aqua-regia. There could be no doubt after this that palladium was a peculiar metal, and that Chenevix, in his experiments, had fallen into some mistake, probably by inadvertently employing a solution of palladium instead of a solution of his amalgam of platinum, and thus giving the properties of one solution to the other. It is very much to be regretted that Dr. Wollaston allowed Mr. Chenevix's paper to be printed without informing him, in the first place, of the true history of palladium; and I think that if he had been aware of the bad consequences that were to follow, and that it would ultimately occasion the loss of Mr. Chenevix to the science, he would have acted in a different manner. I have more than once conversed with Dr. Wollaston on the subject, and he assured me that he did everything he could do, short of betraying his secret, to prevent Mr. Chenevix from publishing his paper; that he had called upon and assured him he himself had attempted his process without being able to succeed, and that he was satisfied he had fallen into some mistake. As Mr. Chenevix still persisted in his conviction of the accuracy of his own experiments after repeated warnings, perhaps it is not very surprising that Dr. Wollaston allowed him to publish his paper, though had he been aware of the consequences to their full extent, I am persuaded that he could not have done so. It comes to a question whether: had Dr. Wollaston informed him of the whole secret, Mr. Chenevix would have been convinced."

As universal consistency is a certain test of truth, so real inconsistency is a conclusive sign of error. Some men try to combine truth and error so as to obtain advantages from both, "to make the most of both worlds," but the result is usually inconsistency, and sooner or later failure. "A man cannot worship God and mammon," nor be an entire truth-seeker and a complete manserver, "between the two stools he falls to the ground," he cannot consistently profess to believe both science and dogma, nor consistently denounce all infliction of pain upon animals, and at the same time live upon meat or wear leather boots. As long as a man's knowledge and faculties are finite he cannot be perfectly consistent. "To err is human," but to be "infallible," even if it is only "in faith and morals," a man must be a god. Each man has liberty, but it has only a limited range.

Error leads not only to inconsistency of conduct but also to crime. As "one falsehood leads to another," so one mistake often necessitates

another, and thus the commission of a single act of error or folly frequently expands into crime, and there are plenty of instances in which the first false step in youth has ultimately led to ruin. The mistake of believing unproved religious dogmas to be vital truths has, in multitudes of cases, led to fearful crimes; for instance, the "Armenian atrocities," etc.; and this agrees with the fact that "a vast body of earnest, intelligent, and cultured clergy" . . . "openly state that in matters of faith they are not amenable to any secular power whatever, not to the House of Commons, the Privy Council, or any secular body" (Cardinal Vaughan, Sermon in the Franciscan Church, Upton Park, Sunday, March 19, 1899; *vide Birmingham Daily Mail*, June 20, 1899); as some men think, so they act, and it has been fully proved that religious liberty, and even human life is not safe, where this Roman Catholic doctrine largely prevails. Error not only leads to crime but sometimes to insanity. Those who begin life erroneously, often end it miserably; a man must perceive and remedy his defects before it is too late.

With every variation of kind of knowledge there is a variation of error, and in every new stage of civilisation a new class of crime arises whilst some old ones disappear. "When the poisons of the Orient and the secret of their use became known in Rome, the murders by poisoning and especially those committed by women increased enormously. Livy has handed down to us an exceedingly interesting account of the wholesale prosecution of a number of prominent Roman matrons who were indicted for this crime" (*The Open Court*, No. 102, p. 1766). "No period elapses in the course of a people's history in which new types of crime do not spring up, and in which the criminal instinct, with the aid of the acquisition and possibilities of that stage of civilisation, does not attempt to evade the law" (*ibid.*). "The totality of a people's intellectual and technical acquisitions naturally determines the form that crime assumes. Acquaintance with the more modern appliances of science and art give rise to new types of crimes; a truth which can be traced through all the pages of history" (*ibid.*). (Consult also Mackay's "Memoirs of Extraordinary Popular Delusions," 1852, vol. ii, pp. 192-216). New scientific knowledge is frequently applied to evil purposes by ill-trained persons; the explosion of an "infernal machine" at Bremerhaven was a fearful example of this.

At the same time that extension of scientific knowledge diminishes the totality of human error, it furnishes new means for the commission of wrong and new methods of detecting it; it was by the scientific contrivance of making the conductors of omnibuses give a numbered ticket to each passenger that the extensive system of stealing the fares in the London omnibuses was detected and prevented. Amongst the numerous inventions for the prevention of error, fraud, and crime, are the following:—The railway-ticket machine for issuing a numbered and dated ticket to each passenger; the mechanical tell-tale for insuring that watchmen in care of premises faithfully walk their rounds at the appointed hours; the money-re-

corder, now so extensively used in shops for registering the amounts of money received for each payment by shop assistants; the system of "double-entry" to prevent mistakes in book-keeping; the various counting and calculating machines to avoid errors in adding or multiplying long series of numbers; the system of identifying criminals by means of photographic registers, by bodily measurements, by finger-marks, etc.; the overtaking, by the aid of the telegraph, of criminals fleeing from justice, one of the earliest instances of which was that of Tawell, a murderer, and produced a great sensation. "Electricity is the criminal's worst and bitterest foe; and next rank the Post and the Press" (Major Arthur Griffiths, one of H.M. Inspectors of Prisons). New methods of detecting mental errors have been gradually evolved by the progress of science, such as the method of proving the falsity of unprovable beliefs of all kinds by means of the test of universal consistency, of proving the impossibility of supernatural existences by the absence of properties and relations (see section 4), and of disproving the existence of a universal mind by the absence of a universal brain.

The error of estimating money above truth and honesty is clearly shown in trades and manufactures. According to H. Spencer, "on all sides we have found the result of long personal experience to be the conviction that trade is essentially corrupt" ("The Morals of Trade," 1874, p. 65); that "the great inciter of these trading malpractices is intense desire for wealth"; and this "results from the indiscriminate respect paid to wealth" (*ibid.*, p. 73); and "the immoralities of trade are in great part traceable to an immoral public opinion" (*ibid.*, p. 80); "a necessary accompaniment of our present phase of progress" (*ibid.*, p. 82), founded upon selfishness, and illustrated by the maxim—"do others, or others will do you." Those who have the monopoly of any special trade or manufacture can usually only obtain and keep it by crushing all who attempt to engage in the same occupation; and in some cases where manufactures and trades are completely monopolised by solitary firms, "might is right"; and large reserve funds are maintained for the purpose of ousting all who attempt to engage in the same manufacture or occupation. Trading under false names, and upon the good reputation of a more worthy predecessor, is another common practice, and the line which divides genuine advertisement from fraud is often undistinguishable. In common life, there are base imitations of nearly all good things, and extensive fraud exists side by side with truth by the general tacit consent of mankind. "This mighty sham, this calling of everything by something which it is not" ("Truth and Opinion," 1840, p. 117), exists in trade, literature, the art of painting, "religion" and other subjects. Thousands of worthy men, in order to maintain self-existence, propagate unprovable beliefs as "gospel-truths," but these actions are as truly necessary in the system of Nature, though not apparently so, as the teaching of mathematics, and all that any man can do is to gradually improve; if adulterators of food and teachers of unprovable beliefs were not necessary they would not be, and that statement must

implicitly contain a correct explanation; even in science, many statements are sometimes modified by popular lecturers in order to make them more acceptable to unscientific persons. "Evil" acts are by no means confined to the lower or illiterate class of persons, but by many of the "educated" and "higher" ones; in each class there is always a portion who virtually train themselves to do wrong; there are not only wilful burglars, but trained money-seekers and place-seekers, who by no means strictly adhere to the first rules of morality whilst in pursuit of their objects. The ways in which not only many small tradesmen, but some large ones, attempt to evade the income-tax are well-known to the tax-assessors; and the practice of assessors themselves in unjustly doubling and quadrupling the assessment upon honest persons, instead of first requesting information, is a species of intimidation, and has brought discredit upon the tax and its officials; when one man does wrong, another one retaliates; it is largely in consequence of some men trying to evade payment that all men are treated as rogues. An American remarked of his fellow-countrymen—"We rob and cheat each other all round, and in every trade and business, and we are all so bent on making money that we have no time to protest against even the most palpable frauds, but console ourselves by going forth and swindling somebody else" (S. Smiles, "Duty," 1892, p. 59). "Gambling, not trading, is our characteristic," and the rule is, "cheat rather than be cheated" (*ibid.*, p. 61). "Commerce and gambling run into each other by shades so gradual that it is hard to say where one ends and the other begins." . . . "All sorts of *time* bargains, whether of securities, railway shares, or produce, where no realities pass or are intended to pass, are as purely gambling as *rouge et noire* and roulette" . . . "and as for 'rigging the market,' and similar expedients, they are not gambling, but fraud" (J. Lalor, "Money and Morals," 1852, pp. 82-83). Every device for obtaining most money is employed; the purchasing public are kept ignorant of what value they are receiving for their money by means of "nominal pints," "nominal pounds," "nominal yards," discounts, and by selling to them by weights, measures, lengths, prices, etc., which they cannot readily calculate; by showy exterior of goods; by quality inferior to sample, etc., etc. Nevertheless, the English appear to be one of the most honest of nations, and however bad matters are here, they are worse elsewhere. In some lands, the common members of society live by downright robbery and violence, and neither human life nor property are as safe anywhere as they are here. But all these "evils" will probably have their day, and the vast army of human crimes and errors will gradually diminish and disappear into the infinite past, as knowledge and the means of observation and detection increase; even war will probably be prevented by science making it extremely destructive. Scientific men look to truth as the real saviour of mankind.

The history of a firm devoted to the pursuit of wealth is, in many cases, as follows:—the first man is industrious and capable, and makes a business; the next is so, but in a less degree, and is able to continue and

increase it; the third has still less commercial ability; but is wealthy and pleasure-seeking, and, finding his business beginning to decline, sells it for more than it is worth, or for the utmost he can get for it, to a limited liability company, and after a little time gets out of it altogether, to pursue a life of so-called "pleasure." The company, saddled with the heavy interest to be paid on too large a capital, without a thoroughly competent manager having a deep personal stake in the business, and being obliged to compete with foreigners, with new inventions, or with new concerns conducted by industrious and able men, continues a lingering existence, adopting every possible contrivance to keep the business alive, until it succumbs altogether. But few firms or companies exist during more than three generations.

It is a frequent error to sacrifice more important things to minor ones; the practice of morality is often injured by being made secondary to the attainment of pecuniary success; Sir Francis Bacon is a memorable example of this. Notwithstanding the importance of personal advancement, a man cannot very consistently be a trade-advocate and a truth-seeker, because an advocate has often to sacrifice the greater good to the lesser in order to secure some limited advantage or pecuniary gain. The element of immediate success is practically regarded as being the most important consideration in life by men in nearly all positions; the most favourable reports, and not the most truthful ones, have to be made of almost everything which has to be sold, or for which support is sought; attractive advertisements and dubious promotion of companies abound. Aristocratic names are said to be bought and inserted in prospectuses of companies for the purpose of attracting buyers of shares. Untruthfulness in such cases often consists more in what is omitted than in what is actually said; and the person who is going to purchase, or the shareholder whose support is desired, must find out the defects for himself. "The sins of trade and business" affect nearly all mankind (H. Spencer, "The Morals of Trade," 1874). All such conduct is in accordance with "business principles," and all institutions involving pecuniary considerations have largely to be governed by them; thus schools, churches, chapels, orphanages, religious missions, charities "salvation armies," philanthropic, and other societies, whether religious, political, scientific, or social, have all to obey those "principles," and adopt the means of ensuring "success." "Nothing succeeds like success," is a popular saying. All these facts agree with the scientific doctrine of universal causation that men, even in deceiving each other, are influenced by their "environments."

It is a very great error to believe in the infallibility of a man or a body of men in the subject of faith and morals. The statement that the Pope "when in solemn conclave with his cardinals, defines an article of faith or imposes a belief, is inspired by the Holy Ghost, and incapable of error," will not bear scientific examination; or "when he, using his office as pastor and doctrine of all Christians in virtue of his apostolic office, defines a doctrine of faith and morals to be held by the whole Church, he, by the

divine assistance promised to him in the blessed Peter, possesses that infallibility with which the divine Redeemer was pleased to invest his Church in the definition of faith or morals" (F. Molloy, "Faiths of the Peoples," 1892, vol. i, p. 49), is equally inconsistent with scientific truth. Of all subjects, the human mind is the most fallible in those of faith and morals, and the least so in those of mathematics and geometry. Even the most comprehensive and complete knowledge of all subjects a man can attain does not enable him to be "infallible" in those particular ones.

Another great mistake is to assume the infallibility or divine inspiration of a book. It was long considered and extensively believed by Christians that the Bible was not only inspired, but that every word of it was the actual revealed word of God, and this is known as the doctrine of the "plenary aspiration of the Holy Scriptures"; but by the progress of science and knowledge, it has been conclusively shown that it contains numerous errors, and "in so far as a book contains errors it is not divine, it is not a revelation from God, whether it be incorporated in the biblical canon or not" (*The Open Court*, No. 143, p. 2277); that only is "divine" which is consistent with all known truths. Even the simple copying of a manuscript gives rise to many errors, and some of those in the "Holy Scriptures" have been attributed to this cause. By the aid of knowledge derived in recent times from a variety of sources, it has been abundantly concluded that some of the best and wisest sayings contained both in the Old and New Testaments have been derived from much older sources, see "History of the Warfare between Science and Theology," 1896, A. D. White). "Many of the parables and sayings in the New Testament have been traced back to the Talmud" (Max Müller, "Natural Religion," 1892, p. 555).

A still more unscientific error is that of "transubstantiation" as defined by the Church of Rome in the Canon of the Council of Trent thus, "If anyone shall say that in the most holy sacrament of the Eucharist there remains the substance of bread and wine together with the body and blood of our Lord Jesus Christ, and shall deny that wonderful and singular conversion of the whole of the substance of the bread into the body, and of the whole of the substance of the wine into the blood, the species of bread and wine only remaining—which conversion the Catholic Church most fittingly calls transubstantiation—let him be anathema." It is almost incredible that any person can, in these days of scientific enlightenment, be so deficient in knowledge of chemistry as to believe that bread and wine can be actually converted by the mere "consecration" of them by a priest, into the body and blood of Christ who died nearly two thousand years ago; and with regard to the curse to be inflicted for not believing it, it is unworthy of notice.

"That which cannot be cured must be endured"; it is a mistake to "kick against the pricks," or to "nurse a grievance"; a habit of complaining is a very common error. As every person occasionally wants some physical change to vary the monotony of his usual bodily condition,

so does he also feel a tendency to complain in order to vary his mental state, even though he has nothing adequate or real to complain about. The habit is usually stronger the greater the ignorance and idleness of persons, and in not a few cases it amounts to monomania. Probably the best remedies for preventing it are:—sufficient physical and mental occupation; the possession of sound scientific philosophy; and cultivation of a feeling of contentment, thinking more of the blessings we enjoy, and less of the trials we endure.

It is an error to suppose:—(1) that we really determine our actions solely by an act of will, independent of all other influences; (2) that no man acts from a pure sense of duty in preference to that of pleasure and self-advantage; (3) that the truth or falsity of "supernatural" beliefs cannot be reliably tested by scientific methods; (4) that all the phenomena of the universe are due to the will of an "universal mind" without a material brain; (5) that science cannot in any case determine what is impossible as well as what is not; and (6) it is the delusion of fatalism to think that something will happen to us irrespective of all natural conditions.

Belief in relics without adequate proof of their authenticity has given rise to many errors. "The principle of reliquism is hallowed and enshrined by love. But from this germ of purity how numerous the progeny of errors and superstitions! Men in their admiration of the great, and of all that appertained to them, have forgotten that goodness is a component part of true greatness, and have made fools of themselves for the jaw-bone of a saint, the toe-nail of an apostle, the handkerchief a king blew his nose in, or the rope that hanged a criminal. The first pilgrims to the Holy Land brought back to Europe thousands of apocryphal relics, in the purchase of which they had expended all their store. The greatest favourite was the wood of the true Cross, which, like the oil of the widow, never diminished. It was carried away by the Huns, by whom it was burnt. Fragments purporting to be cut from it were, in the eleventh and twelfth centuries, to be found in almost every church in Europe, and would, if collected together in one place, have been almost sufficient to have built a cathedral. Next in renown were those precious relics, the tears of the Saviour. Their genuineness was vouched by the Christians of the Holy Land, and that was sufficient. Tears of the Virgin Mary, and tears of St. Peter, were also to be had, carefully enclosed in little caskets, which the pious might wear in their bosoms. Europe still swarms with these religious relics. There is hardly a Roman Catholic Church in Spain, Portugal, Italy, France, or Belgium, without one or more of them. Even the poorly-endowed churches of the villages boast the possession of miraculous thigh-bones of the innumerable saints of the Romish calendar" (C. Mackay, "Memoirs of Extraordinary Popular Delusions," 1852, vol. ii, pp. 303, 304). Christian relics are still abundantly sold in Lourdes and in Jerusalem, and the holy places there are crowded with hucksters and buyers of them.

"In reading the history of nations, we find that like individuals they have their whims and their peculiarities, their occasions of excitement and recklessness, when they care not what they do. We find that whole communities suddenly fix their minds upon one object, and go mad in its pursuit; that millions of people become simultaneously impressed with one delusion, and run after it, until their attention is caught by some new folly more captivating than the first. We see one nation suddenly seized, from its highest to its lowest members, with a fierce desire of military glory; another as suddenly becomes crazed upon a religious scruple, and neither of them recovering its senses until it has shed rivers of blood, and sowed a harvest of groans and tears to be reaped by posterity. At an early period in the annals of Europe, its population lost their wits about the sepulchre of Jesus, and crowded in frenzied multitudes to the Holy Land; another age went mad for fear of the devil, and offered up hundreds of thousands of victims to the delusion of witchcraft. At another time, the many became crazed on the subject of the philosopher's stone, and committed follies then unheard of in the pursuit. It was once thought a venial offence, in many countries of Europe, to destroy an enemy by slow poison. Persons who would have revolted at the idea of stabbing a man to the heart, drugged his pottage without scruple. Ladies of gentle birth and manners caught the contagion of murder, until poisoning, under their auspices, became quite fashionable. Some delusions, though notorious to all the world, have subsisted for ages, flourishing as widely among civilised and polished nations as among the early barbarians with whom they originated—that of duelling, for instance, and the belief in omens and divination of the future, which seem to defy the progress of knowledge to eradicate them entirely from the popular mind. Money, again, has often become a cause of the delusion of multitudes. Sober nations have all at once become desperate gamblers, and risked almost their existence upon the turn of a piece of paper." "Popular delusions began so early, spread so widely, that instead of two or three volumes, fifty would scarcely suffice to detail their history." "A mere list of 'religious delusions' would alone be sufficient to occupy a volume" (*ibid.*, vol. i, p. 7). Commercial delusions and schemes for obtaining money or pleasure without honestly earning it are far more numerous than any.

Among the multitude of crazes which have afflicted mankind in modern times may be mentioned: The tulip mania (1635), the mad Mississippi scheme (1717), the South Sea bubble (1720), the great railway mania (1845), the search for perpetual motion, the running after popular speakers, actors, preachers, mob orators, and singers; teetotalism, vegetarianism, anti-vivisectionism, foolish fashions in dress; crazes for collecting all sorts of things, old china, postage stamps, old books, pictures, orchids, snuff-boxes, tobacco-pipes, old engravings, walking-sticks, egg-shells, and many others. At the period of pilgrimages to the Holy Land in the eighth, ninth, and tenth centuries, religious "relics were eagerly sought after; flagons of water from the Jordan, or panniers of mould from the Hill of Crucifixion,

were brought home, and sold at extravagant prices to churches and monasteries. More apochryphal relics, such as the wood of the true Cross, the tears of the Virgin Mary, the hems of her garments, the toe-nails and hair of the Apostles, even the tents that Paul had helped to manufacture, were exhibited for sale by the knavish in Palestine, and brought back to Europe 'with wondrous cost and care'" (*ibid.*, vol. ii, p. 2). The chief crazes at present are excesses of football and other amusements.

The list of human errors might be indefinitely extended, but sufficient are adduced to illustrate the general truth that error as well as truth is dependent upon the great energies of Nature operating through the structure and surroundings of men, and influencing their conduct:—

"Error is a hardy plant, it flourisheth in every soil;
In the heart of the wise and good, alike with the wicked and foolish;
For there is no error so crooked but it hath in it some lines of truth;
Nor is any poison so deadly that it serveth not some wholesome use;
And the just man, enamoured of the right, is blinded by the speciousness of wrong,
And the prudent, perceiving an advantage, is content to overlook the harm,
On all things created remaineth the half-effaced signature of God."

—*Tupper.*

"Why touch upon such themes? perhaps some friend
May ask, incredulous; and to what good end?
Why drag again into the light of day
The errors of an age long passed away?
I answer: For the lesson that they teach;
The tolerance of opinion and of speech."

—*Longfellow.*

The justification of error is similar to that of "evil"; it lies in the great truth of causation, that whatever is must be, under the existing conditions of time, place, and circumstance, and must continue until some cause arises to alter it (see sections 27, 28). In general it lies in the facts: (1) that it is a necessary prelude to knowledge; (2) that mankind are largely unable to accept pure truth; (3) that its painful effects stimulate human improvement; and (4) that a gradually diminishing state of error is a lesser "evil" than revolutionary progress.

The justification of untrue statements is also necessity. Truth has often to be sacrificed to satisfy unintelligent persons, and theologians are frequently induced to prostrate it in order to satisfy the personal desires and adapt it to the ignorant ideas of worshippers; thus, the Rev. J. M. Wilson, Archdeacon of Manchester, states: "To inquirers we are bound to speak most frankly; but we have no right to disturb the ordinary worshipper if the familiar but imperfect way of presenting truth is a guide to conduct, and satisfies his heart and his intellect" ("Essays and Addresses," 1887, p. 148). It is in this kind of way that Christianity has become less truthful than the religion of its founder. As it is justifiable in certain cases to administer arsenic and other poisons for the good of the body, so is it

supposed to be to employ unprovable dogmas instead of truth to relieve the mind.

With regard to the justification of offering to ordinary persons unproved beliefs as "absolutely certain knowledge" (Cardinal Newman, "A Grammar of Assent," 1870, p. 382), it may be remarked that the same cause frequently produces opposite effects upon different substances, that whilst gold is purified by fire, iron is converted into "rust"; that the same remedies, or the same motives, also not unfrequently act in contrary ways upon different persons; that "what is one man's food is another man's poison"; that some ideas which repel intelligent persons attract ignorant ones; and that in some cases false ideas produce good effects, and true ones "bad" effects upon ignorant minds. But notwithstanding the justification of unprovable doctrines on the scientific ground of ignorance and necessity, the designation of them as being "infallible" and "absolutely certain knowledge" remains an imposition upon the credulity of mankind. Whilst also the value of a man's soul is affirmed to be "infinite," the truth may not be spoken to him in order to save it!! The question to be solved in such cases is whether the evil of imparting consolation to ignorant persons by means of unprovable or false statements is a lesser one than the pain of natural punishment inflicted upon them by speaking the truth. It may in some cases be a lesser evil "in the long run" to try to cure persons by wise infliction of pain than to palliate their dangerous habits and false ideas.

Error, being usually only a form or consequence of ignorance, its method of cure is similar; its cure by prevention is a very gradual process, and is effectual only as knowledge increases, and extends throughout the masses; much good might be done by more extensively teaching the rules of morality. The natural process of cure is often very painful and costly, nothing but severe conflict, and even war in some cases, is sufficient to cure large communities or nations of their mistakes. In the late industrial conflict between employers and employed, the engineers' strike, several millions of pounds were lost by the workmen alone before they found out their error and had to submit to the employers' terms. As it is beyond all men's power to act otherwise than they do under the entire collection of circumstances within and around them at the time, whether they assert falsehoods to be truth, paralyse a great national industry, or assassinate an empress, the chief course open to mankind is to continue to do as they must—viz., sin, and repent, and improve:

> "Were half the power which fills the world with terror,
> Were half the wealth bestow'd on camps and courts,
> Given to redeem the human mind from error,
> There were no need of arsenals and forts;
> The warrior's name would be a name abhorr'd.
> And every nation that should lift again
> Its hand against a brother, on its forehead
> Would wear for evermore the curse of Cain."
>
> —*Longfellow.*

57. "Conscience."

"Conscience" has been put forward by many persons as a definite mental faculty, and as a safe guide to correct moral conduct; for instance, the late Cardinal Newman stated:—"Our great internal teacher of religion is our conscience" ("A Grammar of Assent," 1870, p. 384). "Conscience is nearer to me than any other source of knowledge" . . . "it gives us a rule of right and wrong" (*ibid.*, p. 385); "by conscience we discern good and evil" (Dr. Flint, "Lectures on Theism," p. 216). "To all mortals conscience is a God" (Menander, see Max Müller's "Natural Religion," 1892, p. 177). It has been called an "inward monitor"—"the voice of God within us"—"the source of all truth"—"the arbiter of right and wrong," etc., etc. "The sentence of consciousness is final"—"what the consciousness testifies is truth" (H. Bushnell, D.D., "Nature and the Supernatural," 1863, pp. 25, 27). According to a Jesuit writer, "a dictate of conscience is more binding than is a precept of a superior or a sovereign. It binds with the force of a Divine precept, which it is conceived to be" (W. Humphrey, S.J., "Conscience and Law," 1896, p. 60); the explanation of this is simple, the "binding" power of an idea is usually proportional directly to its degree of fixity, and to what we consider its degree of importance, we cannot, therefore, much alter this even at the command of a monarch; and it is much the same whether it is true or false; and as to conscience being "a Divine precept," that has never been proved, nor is it likely to be; it is only reliable so far as it happens to be true.

The following statements largely represent the common orthodox views of it held by devout Christian believers. "Conscience is that power of mind by which moral law is discovered to each individual for the guidance of his conduct" (Dr. Calderwood, see "First Principles of Moral Science," by T. R. Birks, 1873, p. 249). "I do not hesitate to say with Julius Müller, conscience is the consciousness of God" (W. S. Lilly, "Ancient Religion and Modern Thought," 1885, p. 247). "He" (*i.e.*, God) "speaks to us by another voice besides that of science" (Bishop Temple, "Relations between Science and Religion," 1885, p. 33); but this very important assertion has never been proved. "There is within us a voice which tells of a Supreme Law unchanged throughout all space and all time; which speaks with an authority entirely its own; which finds corroboration in the revelations of science, but which never relies on those revelations as its primary or its ultimate sanction; which is no inference from observations by the senses external or internal, but a direct communication from the spiritual kingdom, the kingdom, as philosophers call it, of things in themselves; which commands belief as a duty, and by necessary consequence ever leaves it possible to disbelieve; and in listening to which we are rightly said to walk not by sight but by faith" (*ibid.*,

pp. 37, 38). According to this statement, every act of conscience must be "a direct communication from the spiritual kingdom," and the question may be very properly asked, where is there proper and sufficient evidence of the existence of this "kingdom," or of "a direct communication" from it? So far from finding "corroborations in the revelations of Science," science supplies evidence that there is no such easy way of arriving at truth in moral questions as by means of "a Supreme Law unchanged throughout all space and all time," and that it can only be attained by the usually laborious test of universal consistency (see sections 52, 55).

"Holiness consists in the subjection of the whole being, not in act alone, but in feeling and desire as well, to the authority of conscience" (Bishop Temple, *ibid.*, p. 49). It was in obedience to this blind authority that multitudes of cruelties have been, and still are, practised by persons who believe in it. It is well-known that "conscience" is frequently wrong and frequently right. Fundamental knowledge is far safer than "conscience" as a guide, and more moral because it enables us to act more certainly and correctly; no intelligent man who possesses sight trusts to a blind one to show him the way in cases where vision is an advantage. "Besides the power of willing we have the power of recognising spiritual truth. And this power of faculty we commonly call the conscience." "It receives and transmits the voice from the spiritual world" (*ibid.*, p. 46). "The voice within . . . commands our duty and it commands our faith. The voice gives no proof, appeals to no evidence, but speaks as having a right to command, and requires our obedience by virtue of its own inherent superiority" (*ibid.*, p. 47). The whole of these quotations inculcate the dangerous doctrine based upon trust in blind belief instead of in proper and sufficient evidence, and it is not surprising that it often leads to such results as the "Armenian atrocities," etc., etc. "Conscience would govern the world if it could" (Butler); and it would do so whether it was right or wrong, as we see by the attempted assumption of temporal power by religious sects.

"In a very special degree the Moral Law" (*i.e.*, the voice of conscience, the "direct communication from the spiritual world" through the conscience) "finds its place even in minds that have very little of thought or of cultivation" (*ibid.*, p. 50); this is largely because ignorant persons are compelled to prefer cheap and uncertain methods to more costly and reliable ones. "This Moral Law which claims obedience from us, equally claims obedience from all else that exists. It is absolutely supreme or it is nothing" (*ibid.*, p. 52); it is, however, well-known that the "voice of conscience" is extremely variable, that it differs in every epoch, in every nation, and in every individual. "The Moral Law" (*i.e.*, the voice from the spiritual world through the "conscience") "calls on us to believe in its supremacy. It claims that it is the last and highest of all laws" . . . "the eternal law of right and wrong" (*ibid.*, p. 53); unfortunately, however, for this great assertion, there exists no such easy "law," human conduct is not such a simple matter, the practical application of "the eternal law of

right and wrong" depends in nearly all cases upon too many conditions to enable us to determine it in such an off-hand way. The "voice of conscience" is not an "eternal law," "the highest of all laws," but merely a rule, and a very defective one, because it only gives fallible intimations. "The Moral Law . . . has a right to require us to disregard everything but itself, if it be itself supreme; if not, its claim would be unjust" (*ibid.*, p. 52). This is a dangerous doctrine, because it often leads to sectarian strife. "The Moral Law" . . . "this Eternal Law is shown to be the very Eternal Himself, the Almighty God" (*ibid.*, p. 57). According to this extreme assertion, every time that any human being blindly decides a question of right or wrong conduct by "the voice of conscience" he receives his decision from "the Almighty God"! "There is a light in my heart, but when I seek to bring it into the understanding it is extinguished" (A. L. Moore, "Science and the Faith," 1889, p. 74); this is fully explicable by the fact that when an unphilosophic person endeavours to solve a complex question by means of his intellect, he frequently becomes mystified and fails, simply because his knowledge and reasoning power are insufficient for the task. A few other writers have spoken very differently, for instance, "There is no such . . . special faculty . . . as conscience" (H. Porter, "Elements of Moral Science," 1885, p. 244); "conscience never tells us what is right or wrong, but simply whether we have done what from some source or other we know to be right or wrong" (Max Müller, "Natural Religion," 1892, p. 181). The foregoing examples are sufficient to show the state of confusion and irrationality in theological minds respecting the idea of "conscience."

Conscience consists largely of instinctive conclusion, and is reliable only so far as it is true; it is in many cases very fallible; it is not a definite mental power like perception, observation, comparison, or inference, nor is it necessarily a safe guide to correct moral behaviour, because it varies with every succeeding stage of civilisation, every different nation, every different "religious" sect, nearly every different individual, and often with the same person at different periods of life. "Conscience is a purely geographical and chronological accident" (Captain Burton). The "conscience" of a Jew forbids him to eat pork, that of Mr. Belfort Bax dictated to him that it was morally proper to defraud a railway company (see p. 414). There are savages whose "consciences" have taught them to kill and eat their aged parents. Under the excuse of "conscience" men have in many cases tried to avoid their duties, have refused to pay their share of rates or taxes, or to have their children vaccinated, the "Peculiar People" refuse to have medical assistance, and both Catholics and Protestants have even burned alive multitudes of their fellow-creatures in order to satisfy their consciences!! Under the promptings of "conscience" Mahommedans persecuted the early Christians, Roman Catholics persecuted the Lutherans, and every Christian sect has more or less persecuted and maligned every other sect; and "religious" persons generally have been "conscientiously" hostile to science. Under the influence of "conscience," etc., the Roman Catholic

Inquisition burned alive about 34,600 heretics, burned in effigy about 18,000, and condemned to the galleys and prisons about 228,000 (see p. 398). If these statements are true, conscience has not been a very satisfactory guide to correct moral conduct. The inefficiency of "conscience," and that of all other restraints yet applied upon wrong behaviour, is shown by the multitude of crimes which are still committed. Even so recently as the year 1895 a Roman Catholic judge in Mexico conscientiously burned alive ten heretics (see p. 426).

A "state of conscience" often arises from brooding upon an idea until it becomes persistent and painful, and the person becomes what is called "conscience stricken"; in this manner Charles IX. of France may be considered to have died of "a guilty conscience" through having, at the instigation of his mother, sanctioned the massacre of St. Bartholomew about two years previously; after that event he "took his favourite physician aside and begged him to find some means to deliver him from the phantoms of the victims which constantly haunted him" (E. Parish, "Hallucinations and Illusions," 1897, p. 80). Regret and remorse are the punishments which are inflicted upon us by natural powers, in some cases long after our misdeeds, and they are usually inflicted whether our errors are due to ignorance or to wilful intention; they are called "pangs of conscience"; comparatively few old persons are quite free from them, and they are often unable to bear solitude, because there are few who have not made some serious mistakes in life. "The still small voice of conscience" does not necessarily indicate to untrained persons the true path of duty, and persons whose lives have been virtuous are very rarely troubled with it. Strong self-conviction, no matter in what way attained, has overpowering influence upon human conduct; thus we often see in the *Times* newspaper advertisements of "conscience money" paid to the Chancellor of the Exchequer.

> "I have heard that guilty creatures sitting at a play,
> Have by the very cunning of the scene,
> Been struck so to the soul,
> That presently they have proclaimed their malefactions."
>
> —*Shakespeare.*

Conscience is often a first impression of what a man thinks he ought to do; it may be either a blind impulse of instinct or feeling, or an enlightened conclusion of the intellect; in the former case it is extremely uncertain as to whether its decision is right or wrong, and even in the latter it is not by any means infallible, especially in abstruse or complex cases, because the reasoning may be defective or be based upon imperfect data. We may regard "conscience" as the immediate mental impression of moral duty indicated by the saying that in cases of duty, "first thoughts are best," "the woman who hesitates is lost," etc., but even in moral questions, first thoughts are not always the best, especially in complex ones, or in matters with which we are not familiar or which require careful consideration; in

such cases the maxim "second thoughts are best" is more suitable. The value of "conscience" varies with each individual; it is greatest with intelligent persons who have been morally trained, and least with ignorant ones whose moral training has been neglected; in the latter class "conscience" is often a very dangerous adviser. "Conscience is ultimately based upon experience, not only of ourselves but of our parents and teachers. It is (in some degree) an inherited tendency; partly it is based upon all the remembrances of our life from our earliest childhood" (*The Open Court*, No. 143, p. 2277). "There is no greater social nuisance than your wrong-headed conscientious man" (Dr. Johnson). There is no easy or cheap method, such as that of "conscience," of becoming moral, any more than there is of acquiring any other valuable ability. "The proof by consciousness is an easy theory and plan of solving Nature's deepest secrets by mere sensualism"; and it is a dangerous custom to allow ignorant "conscience" to usurp the functions of knowledge and reason. Conscience is most reliable only when logically based upon proper and sufficient evidence.

Although we cannot detect or prove moral truth by any other than intellectual methods, we may arrive at correct conduct in two ways, viz., either blindly or intelligently. We arrive at it blindly, instinctively, or automatically, by the influence of good mental habits, by the process of trusting to our inherited and acquired tendencies and beliefs, without knowing why we do so; and, intelligently, by the conscious use of our intellectual powers. The former process being an empirical one is commonly used, and is of great value in cases where it happens to be correct, because that which is automatically or blindly done, is done easily, instantly, by a species of guessing, and without the effort of thinking. Truthful ideas, also, and correct conduct, in certain cases, which originally require much discipline in order to attain them, become by habit so completely converted into acquired tendencies as to be highly automatic; *i.e.*, a man may, to a limited extent, become, by long-continued habit, instinctively and automatically truthful, moral, and religious, without his being able to give intelligent reasons for his conduct.

58. Morality; Its Scientific Basis, etc.

Morality is the subject of social duty, and of right and wrong conduct of men and other animals towards themselves, towards each other, and towards inanimate substances; it includes thoughts as well as bodily actions; some writers even include plants as subjects of morality (see "The Sagacity and Morality of Plants," 1891, by J. E. Taylor, F.L.S.); morality is essentially an animal relation, and especially a human one, of which the rudiments appear in plants; if there were no animals, and especially no human beings, there would be very little moral relation; a solitary living creature upon an uninhabited island could have but few

moral duties beside those towards itself. Where there is no consciousness and no perception there can be no sense of duty, and no morality or immorality. As plants suffer no pain, and have no perception of duty, the acts of "theft," "murder," etc., which they commit, might be termed automatic ones; and many of those committed by the lower animals might be properly classed in the same category. All right and wrong, moral and immoral actions are relative; they all vary with the circumstances; there is no absolute immorality. "Morality is a studious conformity of our actions with the relations in which we stand towards each other in civil society. The highest principle in morals is a just regard to the rights of men" (Beeton's "Dictionary of Science and Art," vol. ii, p. 350).

Although we have no outward moral relations with sticks or stones, and owe them no social obligations because they cannot experience pleasure or pain, we have, nevertheless, to act properly towards inanimate bodies as well as towards animate ones, and the rudiments of our conduct towards animate things are implicitly contained in our behaviour towards inanimate ones; thus we cannot, with impunity, drink too much alcohol, nor stand in the way of a railway train. Those rudiments of moral conduct are expressed in the general rule that we should act intelligently and rationally towards all things, whether they be dead or alive, and the essence of moral conduct is included in rational conduct, it is not considered a "moral" act to wilfully destroy substances, injure one's self, or to commit suicide. All things may be used, but none should be abused. In accordance with the universal principle of action and reaction, if we use anything wrongly we are sooner or later punished, or our children are punished for us; thus, we cannot waste anything without ourselves or our descendants becoming impoverished; if a farmer starves his land, his land will sooner or later starve him; if he overworks his horses, they are the sooner unfitted for work; if a teacher starves his profession by deficiency of knowledge, his profession ultimately starves him. Plenty of illustrations might be adduced to show that, if we act wrongly towards anything, the energies of Nature react upon us or upon our descendants, and that the foundations of moral and social conduct lie deep in the properties of inanimate bodies, and may be traced downwards even to the very molecular movements of our structures, and those of the living and dead things around which influence us.

That is moral which produces the greatest amount of good, present and future, to sentient creatures, and that is usually "immoral" which causes avoidable pain, present and future, to them. The ideas of morality and immorality, virtue and vice, are abstract ones, representing the actions of human beings towards each other under a great variety of conditions, and moral questions are usually the most complex of any, because they depend upon the greatest variety and number of circumstances. The chief difficulties in determining whether an action is moral or immoral, arise from the circumstance that the question is both abstruse and complex;

some ideas, such as those of time and space, are abstract without being complex, whilst moral ones are both. Increased knowledge has led to increased morality, but how far it will ever afford us a measure of it is not known. Nothing shows more forcibly the feebleness of men's minds than the haphazard manner in which questions of moral right are usually settled through absence of definite methods of measurement. In examining a question of moral conduct, the mind must simultaneously act in a threefold capacity, as plaintiff, defendant, and judge; it must keep in view the abstract idea of justice, it must weigh all the items of evidence on each side, it must sum up the two sets of values, strike a balance, and decide. The great difficulty in carrying out the process arises from the complexity of the evidence and the incommensurate values of the items. In questions of morality, men's intellects are often drowned by the complexity and abstrusity; even the decisions of the best equity judges are often uncertain. Who can state all the cases in which it is morally right to punish the innocent along with the guilty?

The morality of politics is said to be "very low"; and in the narrow sense, much of that of theology is equally so. The morality of man is largely that of the society in which he lives; and the mass of mankind have not generally yet been able to attain a high standard of morality. Great power is often "immorally" used, and men "are bold in guilt in proportion to the number among whom their crime is divided" (Sir Walter Scott, "Peveril of the Peak," chap. xxxv). A company may cheat, and be cheated, largely with impunity; and many a man commits acts in committee which he would not dare to do as an individual. Armies plunder and kill each other, and are praised for their deeds. "See the Conquering Hero Comes!" Notwithstanding that it may be equally moral in the widest sense, that which requires violence or untruth to support it is commonly viewed as "evil," and oftentimes as "immoral."

As we possess no distinct faculty for acts of "conscience," so also have we no definite "moral sense." The morality or "immorality" of an action usually depends upon a number of different circumstances, and a variation in any one of them may entirely reverse the decision; it is in consequence of this that "it is dangerous to lay down maxims in morality (J. Dymond, "Essays on Morality," 1836, p. 301). "The desire to do right as right—that alone is morality" (W. S. Lilly, "Right and Wrong," 1890, p. 117). "The true basis of ethics must be sought in reason" (*ibid.*, p. xv); that mere "desire to do right" is alone sufficient is a dangerous doctrine; many a punishable act arises from good-intentioned ignorance.

Moral conduct may be conventionally divided into instinctive and intelligent, and the two classes merge into each other; it may also be divided into physical and mental; intention and performance. "Moral relations and feelings . . . are the necessary products of two conspicuous human endowments—the reflective intellect, and the voluntary impulses or affections" (H. Porter, "Elements of Moral Science," 1885, pp. 137, 138). The moral and social conduct of undisciplined persons is largely

based upon usage; few will dare to do what is right if it is entirely contrary to custom. The whole of man's moral and social duties may be learned without having recourse to supernaturalism; and if a man once clearly perceives that his conduct is wholly due to natural causes, he acquires a rational idea of the basis of morality. As nearly every intelligent moral action requires what we term "choice" between courses of conduct, and every such act of choice is a mental one of comparison and inference, every such moral action is a mental one; we cannot compare things which have made no mental impression upon us. Instinctive moral actions are automatic, and are only moral in a very limited sense. One writer states: "In our moral and spiritual life we walk by faith, not by sight" (J. J. Murphy, "The Scientific Bases of Faith," 1873, p. 286), the most highly moral acts however are the most intelligent ones, because they usually require intentional sacrifice. The morality of a belief or action depends largely upon the circumstance whether we have taken all reasonable care beforehand to ascertain its truth or falsity, its good or evil effect. "Moral evil is arrested development" (R. W. Emerson, *The Open Court*, vol. xi, p. 500, August, 1897). All immorality is antisocial; and is one of the most powerful causes of national decay. The true "backbone" of a civilised nation is less "pluck" than morality and industry. "To learn and labour truly to get mine own living, and to do my duty in that state of life into which it shall please God to call me," is a very good moral rule of general application. "How well it would be if men would but exercise their brains as they do their bodies, and take as much pains for virtue as they do for pleasure" (Seneca).

The exciting cause of nearly all our voluntary conduct whether moral or "immoral" is desire, and as desire itself is caused by our conditions and environments, morality has a material basis. Proper regulation of desire is as necessary in our religious as in our secular actions, because a large portion of each consists of irrational longings and expectations. Immoral actions often look so much like moral ones, and the converse, that it is not much wonder that no simple rules can be laid down to enable ordinary persons to settle every particular case. Multitudes of ideas and actions which we term "immoral" are tolerated partly on account of the pleasure which is associated with them.

Whilst universal causation determines the necessity of all actions, and therefore not only of moral but also of "immoral" ones, the important rule of morality, viz., to do the greatest good and least "evil" determines the morality and "immorality" of our actions. Man is not the only creature who commits "immoral" acts; all carnivorous animals commit murder, nearly all animals steal, and resist being stolen from; even a man hardly dare steal a bone from a hungry bull-dog. According to different naturalists, ants practise war, bees commit robberies, unfaithful sentinel rooks are killed by rooks. The flesh-feeding plants kill animals. Cats are notorious thieves. "Almost every form and variety of human crime is to be found among animals. Cases of theft are noticed among bees.

Büchner, in his 'Psychic Life of Animals,' speaks of thievish bees which, in order to save themselves the trouble of working, attack well-stocked hives in masses, kill the sentinels and the inhabitants, rob the hives, and carry off the provisions. After repeated enterprises of this description they acquire a taste for robbery and violence; they recruit whole companies, who get more and more numerous; and finally they form regular colonies of brigand bees. But it is a still more curious fact that these brigand bees can be produced artificially by giving working bees a mixture of honey and brandy to drink. The bees soon acquire a taste for this beverage, which has the same disastrous effects upon them as upon men; they become ill-disposed and irritable, and lose all desire for work; and finally, when they begin to feel hungry, they attack and plunder well-supplied hives. There is one variety of bees—the Sphecodes—which lives exclusively upon plunder" (*The Forum*, December, 1895; *Review of Reviews*, January 7, 1896, p. 44).

The subject of morality is altogether too large to be fully treated of here, and as that of "immorality" has been included in sections 37, 38, under the more comprehensive title of "evil," it need only be briefly examined. In those sections I have shown that what is commonly called "evil" is not essentially so; that it is caused, equally with what we term "good," by the great natural powers which move all substances and beings, and produce all the phenomena of the universe; that it is indispensable to the existence, welfare, and progress of mankind; and that our inability in many cases to realise the essential goodness of what we term "evil" arises from the complexity and abstruseness of the subject, ineradicable prejudice, and the feebleness of our mental powers. According to the most scientific view, the same natural energies, acting within and around us, which cause our "good" deeds determine also our "bad" ones, and as an act of "immorality," like any other natural phenomenon, is entirely a consequence of the operation of natural energies, it is not essentially "evil," notwithstanding it produces painful effects. It is no doubt by the influence of natural causes or environments, that whilst in Cornwall the proportion of criminals per 100,000 inhabitants is only 57, in Monmouthshire it is 369, in Glamorganshire 302, and in London 258 (*Review of Reviews*, July, 1898, p. 43). "Things make their own morality" (Crozier, "Civilisation and Progress," 1892, p. 395), largely, if not entirely by mutual action and reaction; thus we know that health and comfort promote morality, and that very few men who are starving can be perfectly honest. "The history of religious thought reveals an incessant progress. It always tends to keep pace with knowledge;" . . . "religion is itself an evolved conception" (Rev. J. M. Wilson, "Essays and Addresses," 1887, pp. 139, 145); this indicates that religion, similar to morality, is imperfectly developed; that it is dependent upon knowledge and has a scientific basis.

It is consistent with all known truths to affirm that time and space are infinite; that motion and energy are universal; that wherever there is motion there is mechanical law and order; that there must be a system of

truth representing all natural phenomena; that an universal system of truth is a system of goodness; and it is a well-known theological axiom that "God is Truth." Essential goodness is universal, because the system of natural truth is so; natural truth is universal because natural phenomena are so; natural phenomena are universal and infinite because motion, energy, and the universal ether are so; and the latter are infinite because they are continuous throughout all time and occupy all space. If religious persons in general sufficiently believed that an infinite system of natural truth must necessarily be one of universal goodness, and that all antisocial actions are produced by natural causes, instead of by occult influences, such as "original sin," "innate depravity," "the influence of the devil," etc., they would not be so ready to accept unprovable dogmas, and would learn better how to permanently prevent "religious atrocities." As "immoral" acts are a necessary part of the system of human existence, and are results of the operation of natural powers, and those powers act in accordance with a perfect system of truth and goodness, such actions cannot be essentially immoral, however much so we feel or think them to be, and the fact that we suffer great pain or loss by them is not a sufficient proof that they are essentially bad, but it is in many cases a sign that by inflicting pain they are compelling mankind to improve; nearly every "immoral" act is probably a prompter of progress through the medium of punishment.

It is largely because our very finite minds are unable to comprehend universal goodness that we are unable to believe in it. It is altogether beyond human power to fully conceive the great scientific truth that all actions which we term "immoral" help to work out in infinite time the evolution and fuller happiness of mankind. The greater the degree of fundamental scientific ignorance of men the greater usually is their dissatisfaction with this life and their desire for another. Piety is a very imperfect guarantee of morality, and the greater the sanctity the greater is often the self-deception; this is proved by the great number of contradictory sectarian beliefs, and the habit of untruthfulness inculcated by believing them.

Continual change is a necessary condition of all things. All men are in a state of evolution; perfect in the most comprehensive scientific sense, but very imperfect in the narrow ordinary one; perfect in the former sense at each moment and under all its special conditions and circumstances, but imperfect in the latter one, and continually progressing towards a less "imperfect" state; "never blessed, but always to be blessed." As long as men are "imperfect" they need to improve, and as long as they need to improve they usually require pain to compel them. As long as they suffer pain through the action of inanimate powers in cases of drought, pestilence, famine, etc., which they cannot control, so long will they find it difficult to believe that those powers are essentially beneficent, working out the universal good which they cannot comprehend. The very fact that men suffer pain through the conduct of their fellowmen incapacitates them from believing in universal goodness, and but little impression is

made upon their minds by telling them that human actions, like those of inanimate substances, are produced by natural powers acting within and around them. The circumstance, however, that "immoral" actions produce pain does not prove that they are essentially "immoral," but indicates that their causes or conditions should be altered to prevent a repetition.

The whole of Nature, like a mighty river, is in an incessant and endless state of flux, both as a mass and in its smallest particles, and in a variety of intermediate states of motion, and each of its species of movements has a range of liberty within certain limits. In this way the properties and actions of all bodies are limited between two extremes, and each man and each stone is more or less free. Each man, community, and nation is continually in more or less danger of a social Scylla and Charybdis between the alternatives of stagnation and revolution, decay and progress. If the unscientific section of mankind had all their own way, human life would degenerate into barbarism; and if the scientific controlled all our actions there would be continual revolutionary change.

All men are impelled by their feelings to desire impossibilities; they wish to have pleasure without pain, success without labour, happiness without conflict, morality without "immorality"; they believe in the objects of their wishes largely because they desire them, and some conspicuous theologians say that such desires would not exist unless it was intended to gratify them; but men cannot have all they want, nor avoid all they dislike, they must have the sorrows as well as the joys, they must accept darkness as well as light. They must believe some contradictions, such as that God is omnipotent, but is unable to prevent "evil," etc. The more we comprehensively examine all such irrational desires and beliefs by the help of scientific knowledge, the more we find that, like all natural actions, they are essentially moral.

That which is moral is not necessarily that only which we consider harmonious; that which is called mere "friction" and "collision" when happening between inanimate substances is often called "immorality" when occurring between human beings. Collision, friction, discord, etc., are, however, necessary concomitants of motion and of the existence both of animate and of inanimate bodies; stones as well as men are liable to clashing and breakage, and even the violent destruction of animal life is not usually considered "immoral" when it is necessary to obtain food for human existence. There are discords in music as well as in men. Sudden and violent changes occur with living creatures as well as with dead substances; political and social revolutions, insurrections and wars, although often productive of much pain, are also sources of good; they are violent effects of accumulated human energy, and are as consistent with natural laws as the usual smooth and regular ones. In olden times, when men possessed less knowledge of self-government, and neighbouring nations knew less of each other than now, they were more subject to revolutions and wars; and we may reasonably expect that as knowledge

and facility of intercommunication increase, "immoral" actions generally will continue to diminish. In the "good old times" men in England were obliged to live in castles, and in houses surrounded by moats, in order to protect themselves from each other, and plenty of the remains of these are still to be seen. Even now, in some parts of Hungary and Sardinia, the inhabitants pay tribute to the brigands not to molest them, and in some parts of Arabia whole tribes live by robbery.

Occult ideas, such as those of "original sin," "innate depravity," "man was conceived in sin and born in iniquity," have greatly mystified and complicated the subject of morality; but man is no more "born in iniquity," nor grows to be "sinful" or "immoral" than any other animal: most animals steal, and many murder each other, and there is no proper and sufficient evidence to prove that man alone out of about 360,000 different kinds of living creatures is essentially more "immoral" than they. What is essential moral perfection in man? is it not complete obedience at all times to the energies which govern the universe? if that is perfection, then he has always been compelled to be essentially perfect under his particular conditions and circumstances, is so now and at every succeeding period of time, notwithstanding that he commits "antisocial" acts, he is incessantly changing and becoming "more moral"; or else dying out. According to the most comprehensive scientific evidence, the idea that all men are essentially wicked is an unproved dogma, born of ignorance, and maintained by firmly fixed prejudices:

> "Then say not man's imperfect, Heaven in fault;
> Say rather, man's as perfect as he ought."
>
> —*Pope.*

> "Presumptuous man! the reason wouldst thou find,
> Why formed so weak, so little, and so blind?
> First, if thou canst, the harder reason guess,
> Why formed no weaker, blinder, and no less?
> Ask of the mother earth, why oaks are made
> Taller or stronger than the weeds they shade?
> Or ask of yonder argent fields above,
> Why Jove's satellites are less than Jove?"
>
> —*Ibid.*

According to the ordinary and narrow view, "there is no man perfect, no not one," nor if we examine Nature minutely is there even a single blade of grass, or a single crystal "perfect"; but according to the most comprehensive scientific view, the universe and all that is in it are essentially perfect, *i.e.*, they are as they must be in accordance with all the circumstances; but to scientifically and completely prove seriatim to unscientific minds that even man alone is essentially perfect in all respects is at present too large an undertaking, in fact, they could not believe it; ages will be required to make general such a belief. A man is not necessarily "immoral" nor

even "imperfect" simply because he is not a god; nor is a child really immoral because he is more ignorant than a man. If the ordinary view that man is "innately sinful" or essentially imperfect is a true one, then he never can become perfect, because that would require him to possess infinite knowledge, unlimited power, an infinite brain and nervous system, and unlimited variety of abilities.

The difficulty of understanding the scientific explanation of the "sinful nature" of man lies largely in the fact of evolution, which requires continual change of conduct to suit the incessant change of circumstances which we term civilisation, progress, etc., so that what is moral at one period becomes "immoral" the next, and thus confuses our ideas. It is in accordance with the great fact of evolution that we expect a child to grow into a man, a man to increase in wisdom and goodness, a tribe of savages to adopt civilised habits, a nation to advance in general well-being, and all to continually change and improve. In all these cases the idea of imperfection enters, and is used as a motive to impel us to change; it is, however, more scientific to act from a wide motive than from a narrow one, from knowledge of great principles and a pure sense of duty towards all men than from the narrow notion that "all men are sinful," "conceived in sin and born in iniquity," and it is manifest that if this notion was a true one, its believers ought not to become parents. The idea of morality varies with intelligence, many actions which in past times were considered moral are now considered "immoral," if, however, they were essentially so they could not alter by mere lapse of time, because the essential causes of human conduct are unchangeable.

But notwithstanding all remarks affirming the non-existence of essential immorality, what we in the narrow sense term "immoral" actions are as real as "moral" ones, and there exists an indispensable necessity for "immorality," punishment, etc., as parts of the great process of evolution, and for the terms moral, immoral, criminal, etc., to designate varieties of conduct, and to assist our feeble minds to understand it. Notwithstanding also the justification of "immorality" on the ground of necessity, etc., those who tell untruths, commit frauds, propagate unprovable statements, make unperformable promises, etc., etc., are considered "immoral" by nearly all lovers of truth.

What we term immorality, sin, crime, wickedness, etc., may be scientifically regarded as moral pathology or functional mental disease in social subjects; and we may view moral diseases as being merely cerebral and analogous to ordinary bodily ones (see "Moral Pathology," by A. Giles, M.D., 1895). "Sin, like disease, is a vital process. It is a function and not an entity. It must be studied as a section of anthropology. . . . Spiritual pathology is a proper subject for direct observation and analysis, like any other subject involving a series of living actions" (*ibid.*, title-page, Oliver Wendell Holmes). No man knows when he may be attacked by some mental ailment, and it is much safer to recognise disease and learn how to prevent it than how to cure it.

Nearly all moral disease arises from unregulated desire; every desire exposes a man to the temptation of gratifying it, either by moral or "immoral" means, and animal desires are usually the most imperative. Every different situation, condition, or calling in life has its own moral dangers; thus workmen are tempted to be indolent, clerks and cashiers to be dishonest, tradesmen and priests to be untruthful, officials to be open to bribery, young men to yield to sensual excesses, persons in ill-health to be irritable, and so on.

> "The will is feeble, and passion strong,
> We cannot sever right from wrong;
> Some falsehood mingles with all truth;
> Nor is it strange the heart of youth
> Should waver and comprehend but slowly
> The things that are holy and unholy!"
>
> —*Longfellow.*

In moral questions each man should judge his own actions strictly, and those of others with charity, simply because he knows more about his own circumstances than about those of other persons; for it often happens that the apparently wrong conduct of others is really and perfectly justified by their particular circumstances; no man ought to find fault with his fellow-men without proper and sufficient evidence. Indirect influence by means of moral example is often better than direct verbal advice, because it is less liable to excite personal feeling; and bad example has usually more effect than good example, simply because it appeals more to animal desire and less to the intellect. We often do more good by self-sacrifice than by gratification of our desires.

Morality is not a science, but an art founded upon science, and consists of rules which have to be obeyed. There can be no morality independent of universal law and truth, because they represent the foundations of all human actions. "Whatsoever things are true, honest, just, pure, lovely, of good report, if there be any virtue, and if there be any praise, think on these things" (Philippians, chapter iv). The rules of moral conduct are inseparably dependent upon the verifiable laws and principles of science, including the great truths of causation, continuity, evolution, action and reaction, equivalence, etc. Assuming that there can be no scientific basis of morality, one writer says:—"On this subject," viz., "excellence of a moral ideal," "as on all others, the ultimate appeal is to the common sense of mankind" (J. J. Murphy, "The Scientific Bases of Faith," 1873, pp. 115, 116); such a tribunal is capable of correctly settling many ordinary questions, but not usually those which require comprehensive knowledge and considerable meditation.

Science has both a direct and an indirect relation to morality; direct, by furnishing a verifiable basis of moral rules; and indirect, by promoting human welfare in a multitude of ways through its practical applications. Various of the popular books which have been written on the relations of

science to morality, have been more or less deficient in the statement of scientific principles; and the very fact that a book on such a subject is popular is presumptive evidence that it is scientifically defective. Some persons think that science has nothing to do with either morality or religion, thus:—"Science knows nothing of right and wrong, but only of what is." . . . "Science is not ultimate. It tells us simply what is; it tells us nothing of what ought to be" (Salter, "Ethical Religion," 1889, pp. 7, 295); but "what is" includes what is right and what is wrong, and science certainly indicates in an endless variety of cases what ought to be and what we ought to do; it often tells us beforehand what to expect and how to prepare for it"; "what ought to be" done in order to avoid future "evil."

The idea that morality is essentially dependent upon scientific principles is so largely in advance of ordinary views that many persons will ask, what has morality to do with science? I reply, everything. The dependence of morality upon science is shown in various ways, thus:—Every moral and immoral action requires a cause, involves energy, and produces effects; where there is no cause or motive, there is no moral effect. One of the most fundamental rules of morality, viz., that "we should do unto others as we would have them to do unto us, under the like circumstances," is clearly based upon the law of causation, for unless "the same cause always produced the same effect under the same circumstances" the rule could not be trusted. The Chinese form of the rule, known hundreds of years before the time of Christ, is "Thou shalt not do unto another what thou shouldst dislike him to do to thee." Morality depends also upon the great principles of continuity and evolution, for we know that the present moral condition of mankind has been gradually evolved out of preceding moral states during a long series of ages. All human beings are capable of being morally affected by physical and chemical conditions, by alcohol, opium, and various drugs; and it necessarily follows that the subject of morality cannot be fully understood without previous knowledge of physics, chemistry, physiology, pathology, and psychology. Morality depends upon cerebral oxidation, for without it there is no mental and therefore no intelligent moral conduct. It depends upon consciousness; where there is no consciousness, there is no moral action; —acts performed by persons whilst in a state of sleep or somnambulism, or whilst under the influence of anæsthetics, chloroform, etc., are not usually included in the term "moral." All intelligent moral acts are a class of mental ones, and therefore subject to all the physical and chemical conditions which determine and limit mental action. As consciousness and thought depend upon change of cerebral impression (see sections 43, 44), so also does moral action; its dependence upon such impressions is shown by the fact that moral action is not limited to man, but extends to other animals; for instance, we know that dogs steal, commit murder, etc.; that lambs fight with each other, and doves similarly; that humble-bees habitually intoxicate themselves with honey from the flowers of Centauri

Scabiosa (*Nature*, January 28, 1897, p. 300). "Among animals we find the same spectacle as in the world, whatever moralists may say; they are hardly less wicked or less unhappy than we are; the arrogance of the strong, the meanness of the weak, vile rapacity, short pleasures bought by great efforts, death brought on by long suffering, that is the rule among animals as much as among men" (Cuvier, quoted by I. F. Merz, "History of European Thought," 1896, p. 128). It is often through ill-health or excitement that we commit wrong acts; and it must be manifest to everyone except those who are exceedingly ignorant of science, that no moral or "immoral" act can be performed without a natural cause or motive, and that it is the strongest impression or motive that determines which of two actions a man or other animal will perform; whilst moderate excitement of all our powers is usually moral, "virtue in excess is vice." The command to "avoid temptation" is based upon the great principle of causation, because it recognises the fact that circumstances will affect us whether we are willing or not, and the safest course in all cases of temptation is to keep out of its way; we should also, if necessary, defend ourselves from vice and from bad men. The great scientific truth, that contradictories cannot coexist, is intimately related to moral training; for it is only by continuous occupation in moral duties that immoral conduct can be avoided.

Science, being systematised truth, is the universal foundation of morality. Hitherto, men have been to some extent guided in morals by a narrow theological system, which has tempted and bribed them by unprovable promises of everlasting life and eternal happiness in heaven as a reward for doing right, and threatened them with eternal and undescribable torture by fire in hell as a punishment for doing wrong. This system has been of use in its time whilst mankind generally were not sufficiently intelligent to be influenced by a better, but a very large number of intelligent persons now perceive its irrationality, and that a punishment of eternal torture for a few years of evil conduct is infinitely too great for the offence, and that a reward of eternal happiness for a short period of well-doing is extremely disproportionate to the merit; as also the promises and threats themselves are manifestly unprovable, it is unsafe to fixedly believe them.

An efficient system of morality must have an authoritative basis; rules of morality have not much effect upon men unless they believe that there exists power to enforce them; even a dog will disobey unless he knows that his disobedience will be followed by pain or his obedience by pleasure; children who are never punished are often very disobedient, and become quite a curse to their teachers and parents—multitudes of them despise their mothers and defy their fathers. In order to command obedience, moral rules must be both true and authoritative, but the ordinary theological doctrine neither fulfils the one condition nor the other, *i.e.*, it cannot be proved to be true, nor that its decrees are really carried out; "dead men tell no tales"; in consequence of these defects,

it is gradually dying out, and more satisfactory scientific ideas are taking its place. Rules of moral conduct, when based upon demonstrable scientific laws, appeal to mankind with the authority of omnipotent power and of perfect truth, and possess a far greater claim to obedience than mere unprovable beliefs. As truth is certain, and universal energy is omnipotent, we cannot possibly have greater authority for moral rules than the commands of universal truth, nor have greater power for enforcing them than the omnipotent, infallible, and universal forces of Nature. The whole of morality is essentially included in fulfilment of duty and obedience to law. All the rules of morality are but practical forms of expression of duty, and of obedience to the great powers and principles which govern all things :—

> " Force rules the world still,
> Has ruled it, shall rule it ;
> Meekness is weakness,
> Strength is triumphant
> Over the whole earth."
>
> —*Longfellow.*

All moral actions, like all inanimate ones, are relative, and depend upon circumstances. There is no absolute duty independent of surrounding conditions ; it is usually a paramount duty to preserve one's life, but there are circumstances under which it is a first duty to sacrifice it ; and this occasionally occurs when it is necessary in order to prevent a greater " evil," such as the death of a large number of persons ; the moral question then is, shall one die or many ? The existence of such a duty is also recognised in the sayings, " death rather than dishonour " ; " of two evils choose the least," etc. The degree of morality or immorality of an act varies to some extent with the particular circumstances of the case.

According to a Jesuit writer, " all morality is in the deliberate will. All sin is rooted in, and springs from the will. There is no such thing as a sin of imagination, or a sin of thought. The sin is in the willing to imagine or to think " (W. Humphrey, S.J., " Conscience and Law," 1896, p. 52). " No man can possibly sin except by a voluntary act " (*ibid.*, p. 132) ; but we often think wrongly without willing to do so, and even in direct opposition to our will, in consequence of the influence of our environments ; also, many a man injures another without willing to do it, and is not held blameless because he knew no better. Plenty of evil acts are due to ignorance. " A man is said to have a right to do that which he is free to do " (*ibid.*, p. 174) ; but a man is not allowed to injure others simply because he is free to do it ; he must learn to act better. We do not always punish a man because he wills or even threatens to do a criminal act ; we usually watch and wait until he does it.

It has been assumed by theologians, moralists, and religious persons generally, that science relates only to " base material substances," that it is not directly connected with morality, and that moral phenomena cannot

be scientifically investigated, but must be examined by other methods than those commonly employed by scientific men. One writer asserts that "moral law belongs to the spiritual universe" (J. J. Murphy, "The Scientific Bases of Faith," 1873, p. 285); but where or what is that universe? A popular expositor of religion said:—"The phenomena of the human soul are essentially different from the phenomena with which the student of science is most familiar, and must be investigated on other principles and by other methods."—"I myself am not under the dominion of natural law,"—"my moral life is essentially a supernatural thing." "As soon as you approach the intellectual and moral life of man, you enter a region in which you have to do with a new order of facts" (R. W. Dale, "The Mutual Relations of Physical Science and Religious Truth"); but the assertion that "moral life is essentially a supernatural thing" has never been proved, and is not likely to be.

I venture to affirm that the chief rules of morality may be scientifically investigated. It is well-known that by exciting speeches men may be incited to commit crime, and that by placing temptations before persons, experiments may be made on their morality; for instance, employers sometimes test the honesty of their servants by placing money, etc., in their way. That the physical condition of poverty is a frequent cause of crime, that insanitary homes and ready access to alcohol help to produce drunkenness, and that easily-acquired wealth conduces to licentiousness in undisciplined persons, are also commonly-known facts. In a state of fever, and in alcoholic intoxication, the poisoned blood, circulating through the brain, causes delusions, false beliefs, the commission of crime, and sometimes suicide, and downright madness. These facts do not appear to agree with the bold assertion that "the world of morals is as distinct from the world of science as is a wine from the cup that holds it" (W. H. Mallock, "Is Life Worth Living?" 1882, p. 210). With regard to the assumption that all moral questions are distinct from science and beyond the sphere of scientific investigation it may be further remarked: Truth is perfect consistency and agreement with all other truths, no matter what the subjects may be. There is no easy method which will enable us to infallibly arrive at truth in moral questions any more than in chemical ones; what is right and good, and what is wrong and "evil," are ascertained by essentially the same means as what is true; mere blind instinct alone will often not enable us to do it. It is largely by habit and careful training that we instinctively do what is right in ordinary cases.

The "order of facts" in the subject of morality require essentially similar mental treatment in order to test their truthfulness as those to which scientific research has been already applied with such success, and not only to those in which we are able, but also to those in which we are not able, to produce, by means of experiment, the phenomena to be observed, such as those of astronomy, geology, and many of those occurring in living creatures. Different subjects are experimental in different degrees, those of physics and chemistry are highly so, and therefore capable of

gradual reduction to scientific system by means of our intellectual powers; we often arrive at conclusions in moral questions by means of experiments ready made for us, viz., by observing the influence of circumstances and environment, temptation, etc., upon human conduct.

That moral and "immoral" actions are governed by natural energy, even in cases where it would be but little suspected, and would by common opinion be attributed to "chance" or "accident," has been proved by means of statistics and the scientific "method of averages." M. Quetelet, who has made laborious researches in statistics, has shown that "in everything which concerns crime the same numbers re-occur with a constancy which cannot be mistaken; and that this is the case even with those crimes which seem quite independent of human foresight; such, for instance, as murders, which are generally committed after quarrels arising from circumstances apparently casual. Nevertheless, we know from experience that every year there not only take place the same number of murders, but that even the instruments by which they are committed are employed in the same proportion" (Buckle, "Civilisation in England," vol. i, p. 25). The number of suicides in London varies from 213 to 266, and averages 240 (*ibid.*, p. 29).

Actions which agree with moral rules are results either of instinct or intellect; the instinctive ones are automatic and necessary consequences of internal nervous actions and promptings, and are performed without the aid of intelligence. Provided, however, that a man acts rightly, we do not usually inquire minutely into his causes of action, but when he does harm we usually examine closely into the reasons why he did it, and if he did not use his intellect to try and avoid doing injury we condemn his conduct; but however defective or even criminal a man may be in his conduct, if he has done some good which the public can understand, a great many persons will defend him, and condone his bad acts for the sake of his good ones. "Charity covers a multitude of sins," and the public do not too closely inquire how the charitable obtain their money; popularity also hides many moral defects.

No man can safely neglect his moral character; if he does, he becomes a curse to himself and to all who have to do with him; he is not fit to live. A man's character ought in some cases to be dearer to him than his life, because if he loses it he is ever afterwards unhappy, and it is better to be dead than always miserable. But goodness of conduct requires good training and wisdom, and the latter cannot be acquired without comprehensive knowledge; the greatest good is usually done by the wisest men. Perfect knowledge necessarily conduces to perfect goodness, because it excites the desire to do the greatest good. In accordance with the universal scientific principle of action and reaction, true ideas stimulate good conduct, and right conduct excites truthful ideas. The very essence of morality is to love to do right and fear to do wrong, but in complex cases there are many ways of going wrong and usually only one of going right; broad is the road which leads to destruction, and narrow and crooked is

the way which leads to happiness. According to E. Renan, "seriousness is the first essential of morality and religion," and this agrees with the fact that it often requires serious thought to enable us to determine the most correct course of conduct. To be an honourable man is better than to be a clever man. "The character of Newton was marked by sedateness of demeanour, soberness of conversation, sobriety of conduct, and absorption in thought" (J. P. Cooke, "The Credentials of Science," 1893, p. 91); a similar remark might be truthfully made respecting nearly all the greatest discoverers and philosophers.

Very few men are "a law unto themselves"; the practice of morality usually extends only as far as persons think they can perceive some personal advantage or immunity from punishment to be gained by it; hence it is that those who can extensively foresee the future consequences of their acts are more moral than those who are ignorant, not so much because they have better intentions as because they can perceive the future effects more clearly than those whose minds are more occupied by immediate pleasure and personal desires, or in supporting some particular doctrine or sect. Goodness is a product of perfect obedience to law; that man alone is a "law unto himself" who habitually acts in harmony with all the energies and laws of Nature, and not he who has merely "good intentions."

"A special reproach has been made against science that it is not yet ready to provide humanity with the moral direction of which it stands in need" (M. Gaston, *Nature*, February 4, 1897, p. 322); it is, however, much more the function of theologians than of men of science to supply moral directions to mankind because they are the professed teachers of godliness; further, theologians and the Church have at nearly all times and in nearly all places claimed a great superiority of sectarian doctrines over science as a basis of morality, largely upon the ground, that whilst science treats only of "base material things," religion relates to "divine and heavenly ones," as if verified truths were not more "divine" and "heavenly" than unprovable assertions. Thus, according to the Rev. J. Martineau:—"it is a fatal delusion to imagine that the completest acquaintance with science affords any guarantee of higher goodness" ("Faith and Surrender," 1897, p. 14):—"scientific culture is morally neutral, simply enlarging the range without altering the quality of the character" (*ibid.*, p. 15):—"the only knowledge that can really make us better is not of things and their laws, but of persons and their thoughts" (*ibid.*, p. 16); and many other reverend gentlemen have written and spoken in a similar strain. With narrow views of science it is easy to come to such conclusions; I venture, however, to affirm that the sole object of pure science is truth, that truth is the most essential basis of morality, and that the chief principles of science are much more moral than some of the hypotheses of ordinary Christian theology; theologians have themselves affirmed that "the love of truth is the love of God," and "the basis of all the virtues," and if these affirmations are true, and pure science is really a pursuit of truth, it cannot be correct to say that "scientific culture is

morally neutral"; or that "the completest acquaintance with science" does not "afford any guarantee of higher goodness." As also nearly all great scientific men have been very moral, it is an unjust reflection upon them to say that "it is a fatal delusion to imagine that the completest acquaintance of science affords any guarantee of goodness"; we have only to read the lives of the most eminent scientific men and philosophers to perceive that this affirmation is incorrect. It may also be remarked that whatever may be the degrees of relative merit of science and theology as bases of morality; and whatever may be the amounts of difference of opinion existing amongst scientific men respecting matters of science, those differences of opinion have never culminated in war and wholesale murder like the differences of theologians and sectarians have on so many occasions, and are now (1898) doing in the island of Crete. These murderous results of blind theological beliefs agree with the statement of a writer that, "to improve the moral or physical aspect of society was no part of the Christian scheme" (Sir R. D. Hanson, "The Jesus of History," p. 13), and with the remark that "morality has grown up independently of, and in spite of theology" (Leslie Stephen, "Social Rights and Duties," 1896, vol. i, p. 20).

Notwithstanding that scientific men have done, and are now doing, a vast amount of labour which either directly or indirectly improves the moral condition of mankind, it is theologians who claim to be the chief guides of the moral conduct of men, and we may reasonably expect them to be competent for their profession, and to understand the foundation of their own special subject. The question may therefore be asked, why, with all the great truths and principles of science at hand in text-books, has not some "minister of truth" constructed a scientific basis of morality? In accordance with the claim to a higher morality for theology than for science, the Vatican Council, July, 1870, promulgated a decree, making the enormous claim that "the Pope is infallible in matters of faith and morals"; if, however, this claim is true, why has the Pontiff not made known an infallible basis of morality for the benefit of his suffering fellow-creatures? multitudes of whom are in continual perplexity and pain through want of it. In reference to this question we may safely say that it is not in questions of "faith and morals" that the nearest approach to human infallibility is to be found, but in those of mathematics, physics, and astronomy; the subject of morals is about the most uncertain of any, largely because of its great degree of complexity, whilst those of mathematics and physics are very much less so because of their greater simplicity, but even mathematicians and physicists are only "infallible" within the narrow limits of human ability. When men of science possess knowledge in astronomy, physics, or chemistry, they prove their infallibility by predicting eclipses and making discoveries for the good of mankind, but no discoveries appear to have been made by the aid of self-assumed "infallibility in faith and morals."

Complaint has also been made that the teaching of ordinary science,

such as mechanics, physics, chemistry, physiology, and natural history, has not had a greater effect than it has in making young persons moral (see address by the Rev. Canon Gore, *Birmingham Daily Post*, December 4, 1896), but a little consideration of the subject will show that although ordinary technical scientific instruction indirectly conduces to morality it does not go directly to the point. We know that knowledge of physics, although a necessary basis of chemistry and conducive to an appreciation of it, does not alone make a good chemist, but requires to be followed by a direct course of practical chemistry itself; similarly, a knowledge of ordinary science does not make a person very moral, but requires to be followed by a direct course of instruction in fundamental science and in the rules of morality based upon it. The direct remedy for the numerous small immoralities in civilised communities is not to be found in ordinary technical science, but in practical moral rules, and by showing the inevitable consequences of disobedience to omnipotent powers. It is in consequence of a great deficiency of practical moral teaching that the moral conduct of the rising generation has not more improved. It has a much weaker moral effect upon a person to tell him that he will be rewarded or punished after death in accordance with his deeds, if you cannot prove to him that a future life exists, than if you show him that he is governed by omnipotent powers which will infallibly reward or punish both him and his children in accordance with his conduct, and illustrate the teaching by real and provable examples.

It has been further said that literary culture is better than science in developing the noblest character. "One of our most brilliant and influential writers (Mr. Matthew Arnold) has expressed the opinion that the details and methods of science are unfit materials to form the basis of liberal culture" (J. P. Cooke, "The Credentials of Science," 1893, p. 195, from the Rede Lectures at the University of Cambridge). The correctness or otherwise of this opinion depends largely upon the meanings of the term "details" and "methods." If they mean those of technical physical experiments and chemical analyses, or the training of scientific experts, the opinion is largely true; but if they include those of the most comprehensive science the statement is very erroneous, because the great natural energies of the universe are the fundamental basis of all human conduct; it is well-known also that the nobility of character of the greatest scientific discoverers will bear comparison with that of the most eminent literary men. Equally at least with the heroes of literature, "The noblest martyrs of science are not those who have braved great dangers and succumbed only before the unattainable; but rather those who have suffered even unto death, in consequence of depreciation, deprivation, and neglect" (J. P. Cooke, *ibid.*, p. 255). It is more noble to suffer for verified truth than for unprovable beliefs; the former is intelligent heroism, whilst the latter is ignorant fanaticism, and the man of noblest character is not he who unwisely sacrifices his life for unverified dogmas, but he who does the greatest good, and if needs be, at the cost of his life; but no man can do

the greatest good without the possession of fundamental knowledge; and science alone supplies this.

All scientific discoverers have necessarily been conscientious lovers of truth, otherwise they could not have made their discoveries; they have submitted their ideas and hypotheses to severe tests, and have not usually allowed their personal desires to become fixed beliefs. Instead of begging for help, or standing aside and selfishly expecting other persons to test their ideas for them, they have performed the labour themselves, and have given all their discoveries to mankind. Truth is often more attainable in matters of science than in either theology or literature, because in science statements may usually be verified by appropriate tests at any subsequent period of time, but in the literature of theology or history, after an event has once occurred it can never happen again. The chief subject of literature, viz., knowledge of man, constitutes only an inconceivably small fraction of knowledge of the universe; and that of his history cannot possibly supply a more liberal culture than that of the universe itself, and the great energies and laws which govern it and which underlie and determine all human history; hence it cannot be truly said that the "methods of science are unfit materials to form the basis of liberal culture," nor that "scientific culture is morally neutral."

"It must never be forgotten that men may know what is right and do what is wrong, and hence the due stimulation of the moral emotions, so that they may respond to the improved moral judgment, is at once an indispensable branch of moral education and an indispensable condition of moral progress. But this is the function, not so much of the scientific moralist as of the parent, the instructor of youth, the poet, the dramatist, the novelist, the journalist, the artist, and, above all, of the religious teacher" (T. Fowler, D.D., "Progressive Morality," 1895, p. 83). Teachers of religion might do a vast amount of moral good to mankind by becoming worshippers of verified truth instead of unprovable assertions, by acquiring familiar acquaintance with the great powers and principles of science which govern the universe, and fearlessly diffusing such knowledge.

"On nothing did Huxley insist, perhaps, more strongly than on the conception that great as are the benefits which accrue from science, greater still is the intellectual and moral good which it brings to man" (M. Foster, *Nature*, October 22, 1896, p. 604). Morality, based upon great verifiable scientific principles must of necessity be far more reliable, more pure, and more productive of "the peace which passeth all understanding" than that which is founded upon unprovable doctrines. The history of the warfare between science and theology affords plenty of instances of science having purified theological belief (consult A. D. White's book on "The Warfare of Science and Theology," 1896). Science, by substituting knowledge for blind unreasoning faith, is gradually in various ways promoting "peace on earth, good-will towards men," and is the great detector of falsehood, error, crime, and evil in a multitude of cases in which theology

entirely fails, and which need not here be enumerated. "Science influences mental and moral culture most palpably." "If I commit such and such offences, says the believer in a higher form of superstition, I shall be punished; science asks how and why, and in the answer finds the real reason for the moral law. Science finds that offences against right and justice brings always their punishment with them, and shows cause why; establishing a sounder and nobler morality than any founded on the merely superstitious fear that some unexplained punishment will fall on us for wrong-doing" (R. A. Proctor, "Mysteries of Time and Space," 1892, p. 360).

Ignorant persons are always looking for easy ways of obtaining valuable possessions, and this is often a stimulant to improvement; but there is no cheap and easy method of becoming moral, men in general cannot be suddenly made pure by any violent method, neither by Act of Parliament, nor by means of "conversions," but only gradually by means of intelligent conviction and habit. Mankind will, therefore, in the future, as in the past, have to submit to a gradual evolution of morality in accordance with the operations of natural powers, but the rate will probably be accelerated by increased scientific pressure. Morality in general advances with the degree of civilisation in different nations and communities; the cruelties now practised in the kingdom of Dahomey and the city of Benin would not be allowed in any civilised country. It is stated that with some savages, to marry a girl out of the tribe is worse than murder; that with the Bhattias of India, to dine in an hotel is one of the worst of crimes; and that with the Mahommedan Wahabees, the act of smoking tobacco is considered a greater crime than that of adultery (Clodd, "The Story of Creation," 1890, p. 220). In every nation, some acts of human conduct, important in themselves, but not really immoral, are often treated as if they were crimes; this is especially with some unconventionalities and breaches of etiquette in society; fixity of cerebral impression partly explains this; the more fixed the idea, the more important does it appear, and the more easily is it excited; thus devout persons are easily offended by the least remark which questions in the smallest degree their unproved sectarian beliefs. As different fixed beliefs are often due to difference of training, some of those of one nation or sect are often highly offensive to another.

> "For modes of faith let graceless zealots fight,
> He can't be wrong whose life is in the right;
> In Faith and Hope the world will disagree,
> But all Mankind's concern is Charity."
>
> —*Pope.*

> "Happy the man whose lot it is to know
> The secrets of the Earth. He hastens not
> To work his fellow's hurt by unjust deeds,
> But with rapt admiration contemplates

Immortal Nature's ageless harmony,
And how and when her order came to be.
Such spirits have no place for thoughts of shame."
—*Euripides*, "Fragm." 90.

59. The Morality of Necessity.

As causation is universal, all creatures do as they must under their existing conditions of property and environment. That which is absolutely necessary is not essentially "immoral" however much pain it may produce; and all men have a right to do that which they are absolutely compelled to do; but if their acts injure other creatures, and were avoidable by greater knowledge or change of environment, their fellow-men also have a right to examine their conduct, and if necessary restrain, punish, and compel them to alter. That "immorality" and necessity of improvement exist on a large scale is proved by the circumstance that recently "between 500,000 and 600,000 cases were annually tried in the Criminal Courts of England alone, whilst the total expense of protecting society against criminal offenders of one kind and another in the British Islands fell little, if anything, short of ten million pounds a year, forming nearly as great a drain upon the national resources as pauperism" (Rev. W. D. Morrison, "Punishment and Crime," *The Standard*, December 3, 1896, p. 2). "Young offenders especially did not very philosophically or accurately weigh the consequences, and the Report on Prisons showed that the old offenders were constantly returning" (*ibid.*).

That which we usually term "immoral" conduct is continually changing in feature, and gradually diminishing in violence with increase of civilisation; and that which is considered moral by one man or one nation is often treated as "immoral" by another; but in the midst of these and other variations the chief scientific bases of morals, viz., the principles of universal causation and evolution, remain unchanged; and the essential rules of morality based upon them remain invariable. Although the basis of morality is immutable truth, the great powers of Nature permit some latitude of action of human beings as well as of inanimate things; thus there is a freedom of action between the extremes of ignorance and learning, vice and virtue, altruism and selfishness, etc., as there is between the limits of vibration of a pendulum, the rise and fall of the tides, the calm and the hurricane. Man, like everything else, is free to act within the limits of his properties and environments; he may either be a retarder, maintainer, or advancer of morality, according as he is compelled to be by his nature and circumstances. A man cannot be moral unless he is to a certain extent free; a vast number of persons who sincerely wish to live pure, holy, and godly lives, are unable to do so, simply because the undertaking is too large for their knowledge, abilities, and opportunities. "One man is as good as another" in the sense of being equally determined by causes. An excess of virtue is a vice; many men sacrifice themselves and

others to the great Juggernaut of progress; too rapid progress is unbearable and revolutionary; and too great love of truth is too exacting and severe for uncultured persons to bear.

Man, being a part of the universe, is governed by the same general powers as the whole of Nature around him, as well as by minor causes peculiar to himself and his circumstances. Nature's most comprehensive rules of government are might and right, and are based upon omnipotent power and universal truth; and might in the widest sense is right, otherwise the moral action of natural powers could not be universally trusted; in the narrow or ordinary sense, however, the statement that "might is right" has numerous limitations, which differ in nearly every different case. Natural rights are common to all men, the chief limitations being in the case of lunatics, and in that of dangerous criminals, who may be regarded as insane. Every man has a natural and moral right to do the greatest good he can; nearly every one has a right to live, to have food, clothing, and a dwelling, to enjoy the light and air, to use the surface of the land and sea, to move and think with freedom, to see, to speak, to listen; to acquire knowledge, property, social position, and fame, and within certain limits to use them; but "he who will not work, neither shall he eat." Under some circumstances men have a moral right even to forcibly take property from each other; thus a landlord may distrain goods for his rent. Legal right is founded upon natural and moral rights, and these are based upon universal natural law and omnipotent energy. The law of the strongest is exhibited by inanimate matter as well as by plants and animals; all bodies move in the directions in which they are most impelled and least resisted; an avalanche crushes all inanimate as well as animate things which are in its way, houses as well as the people inside them. It is the very essence of justice and charity to remember that every person does as he must, under the whole of the particular conditions and circumstances which influence him.

Necessity is a term largely synonymous with causation, and it is a much more comprehensive one than that of morality, because it effects the whole of the actions of all animate and inanimate bodies, whilst morality refers only to those of living creatures. In accordance with the law of action and reaction, each man necessarily acts and reacts upon surrounding bodies and upon his fellow-men, and they act and react upon him; thus a railway train compels persons to get out of its way; a great mass of fire compels them to stand at a distance; moral men are largely compelled to avoid "immoral" ones, etc., etc.

Physical necessity usually takes precedence of everything, even of "conscience"; thus, usually first it is life for self, and then life for others; it does not, however, necessarily exclude moral responsibility; we are all of us rightly expected to act up to the limits of our knowledge and powers in performing our duties. If we possess knowledge and ability we are reasonably expected to foresee consequences and to provide for them, or to give proper and sufficient reason for

not doing so. Responsibility to act rightly goes hand in hand with power, the two are correlative; and might is thus coincident with right. Knowledge of great scientific truths suggests to us moral rules of conduct, and thus makes us responsible to act in accordance with them. Scientific philosophers and those who believe in universal causation, sometimes called "fatalism," are often more guided by true moral rules than the most "religious" persons, simply because their fundamental knowledge is greater, and because unscientific persons often prefer to trust to the dictates of their instincts and feelings, and to dogmas, rather than to knowledge or wisdom. Ordinary persons are practically compelled to "swim with the stream" because the sanction of their fellow-men is a chief regulator of their conduct. It is largely in consequence of being compelled to do as the majority do that morally disposed persons often cannot get through life without practising falsehood, deception, and dishonesty. According to a Catholic writer, "In the necessity which is called *extreme*, it is lawful for a man to appropriate something which is the property of another, if and so far as the use of it is absolutely necessary to him in his present mind. This is common doctrine, which is without question. It rests on the ground that the rights of human persons are subordinate to a right of human nature" (W. Humphrey, S.J., "Conscience and Law," 1896, p. 195), but if he can beg it from the owner, he ought to do so (*ibid.*, p. 197); this rule, however, might in some cases be used as an excuse for robbery, unless there was a competent party present to decide what is "extreme," because an interested person under the influence of pain and want is apt to consider many things "absolutely necessary to him" which are not, and to forget that his present sufferings are probably consequences of his previous acts of neglect.

But in addition to compulsory obedience to the law of causation, mankind have to obey that of evolution; they must not only satisfy immediate wants, but also improve and prepare for the future; and this requires them to continually change, to abandon old ideas some of which have been held for centuries, and accept and act upon new and more moral ones. That there is great latitude of action in this case is shown by the circumstance that whilst one man advances human progress by continual self-improvement, another retards it by remaining ignorant and inducing others to do the same and to believe unprovable statements. The great latitude allowed to human action is shown by the large extent to which falsehood exists side by side with truth, fraud with honesty, and the old along with the new, belief in unprovable theological dogmas side by side with the great verified truths and laws of science, the mysteries and unrealities of ecclesiastical ceremonies in company with the steam-engine, electric-telegraph, phonograph, photography, the cinematograph, etc., etc. Of two unavoidable evils it is always a moral duty to choose the least, and it is often a greater advantage to improve ourselves and others than to encourage ignorance; it is frequently a great moral duty to sacrifice immediate

personal benefit to future general good; all men have to wait until causes produce their effects, like a farmer has to wait for his harvest. The fact that unintelligent persons are willing to believe untruths does not justify any one telling them falsehoods, probably the only justification is when it happens to be the least of two unavoidable evils.

Morality is usually considered to include only those actions over which a man has or might have had some control; in practical life a man is usually held blameless for doing that which he was manifestly and absolutely compelled to do, however disastrous to other men the effects may happen to be, especially if he previously took every reasonable precaution to prevent or avert them; for instance, a captain of a ship may run his vessel ashore, if it is necessary, to save the lives of the passengers. In ordinary law, also, men are not held liable for the effects of what are termed "acts of God," such as hurricanes, floods, lightning, etc., and all reasonable persons acquiesce in the statement that "what we must do we ought to do is both legal and moral," provided that, if it happens to be a case of two unavoidable evils, we choose the least, or of two good courses we choose the best. Scarcely any good effect is attained without some sacrifice or some inseparable attendant "evil," and an essential question in all such cases is, will the total good outweigh the entire evil? or will the end justify the means? wars and religious atrocities have been justified in this manner. Hanging or imprisoning a murderer is usually considered to be justified, if it is necessary, in order to prevent his killing more persons. There is rarely an advantage without an accompanying disadvantage; and the converse; and either may be greater of the two. If we never do good until we know that there is no evil attached to it, we shall never do any at all. We put up with great defects in men, houses, scientific inventions, etc., if they are accompanied by greater excellences. We know that all animals kill each other in order to maintain self-existence; and that men kill countless numbers of other animals in order to preserve their own lives; they commit the lesser "evil" in order to avoid the greater one, and we consider these actions moral. We know, also, that hundreds of thousands of persons have been tortured and killed in order to "save their souls," in which case "the greater evil" was only an hypothetical one; and we know that multitudes of untruths are continually being told for a similar purpose.

Similarly with stealing, is it never justifiable? "Tell me," asks Achen of the priest, "if I have nothing to eat, and if I find wherewith to appease my hunger, may I take the goods of another?" "Believe me, if you have nothing to eat, and you meet with something, you would be a fool not to take it." "That is good counsel, but here is a difficulty: what I have taken in this way, ought I to return it?" "No, the observance of the law would subject you to a fast too severe; you are a great fool if you do not understand that in the face of necessity all things belong to all." This is a quotation from Bouillier's "Les Dialectes et les Chants de la Sardaigne," cited by H. Ellis in "The Criminal," p. 197. The latter

writer remarks, "That is the morality of a lawless and primitive society, but it has points of contact with some of the latest and highest development of social morality. Tolstoi would justify it; as to a certain extent a respected archbishop has justified it." It is practically also the doctrine contained, though not usually explicitly stated, in recent publications of socialistic writers. It is, however, largely unsound, because we may usually only take the property of others by their actual or implied consent, or in accordance with the rules of society, and the justification would depend upon the whole of the circumstances of the particular case; further, if this rule was allowed without qualification, men of bad principle would excuse their evil acts on the plea of necessity, irrespective of circumstances, and under such a condition society could not exist. The property of individuals is often taken by public law for public good, and this is justified as being the lesser evil in the particular case. Persons who wilfully bring themselves to poverty and want may not be readily allowed to rob or defraud others in order to remedy the consequences of their own defects; they may not throw themselves upon the poor-rate whilst there is remunerative work for them to do. Mankind do not usually require encouragement to steal, but rather to refrain from stealing; there are also, in all civilised countries, less objectionable methods of relieving personal necessity than by fraud or robbery.

There is a limit to which the plea of necessity rightfully extends, and, when a man pleads that he was compelled to do wrong, the case is usually investigated, and such measures taken as will in future help, induce, or compel him to act rightly; if he feels compelled to do wrong, society feels equally compelled to correct him. Even nations put a strain upon other nations to improve, as in the case of England, France, and Russia, constraining the Sultan of Turkey to prevent the "Armenian atrocities." The plea of necessity will justify much "evil," but it will not justify unlimited injury nor persistent neglect of self-improvement or of moral rules.

Although "immoral" acts are as much the consequences of the operation of natural powers as moral ones, and men are as truly compelled to commit them, it by no means follows that men can do so with impunity, because the operation of the same powers compels their fellow-men to restrain and punish them. A scientific basis of morality, therefore, largely agrees with, and practically leads to, a very similar code of morality to that which already exists, but more especially to a continually improving one; the chief difference between the scientific and the ordinary one is that the former is more truthful and reliable, and conduces more to moral progress.

The late Cardinal Newman said that "no legislator or priest ever dreamed of educating our moral nature by science or by argument" ("A Grammar of Assent," 1870, p. 93); and this is quite true, simply because no legislator or priest appears to have known of the existence of a scientific basis of morality; but, in consequence of the great social and moral advantages of science which have accrued to mankind, our legislators are

now gradually perceiving the connection of science with morality, and are beginning to frame their laws more consistently with it.

60. The Chief Rules of Moral Conduct.

A new moral code is wanted (*Review of Reviews*, February 7, 1897, p. 161). "The establishment of rules of right conduct on a scientific basis is a pressing need" (H. Spencer; see "The Great Enigma," 1892, p. 158, by W. S. Lilly). "The ultimate origin of moral rules, I conceive, so far at least as science can trace them, is to be found in the effort of men to adapt themselves to the circumstances, social and physical, in which they are placed" (Professor T. Fowler, D.D., "Progressive Morality," 1895, p. 101). Both the subject and the rules of morality have hitherto been largely in an empirical and confused state, and have not been usually recognised as possessing a definite scientific foundation; in moral questions we have obeyed certain arbitrary rules because they have been found to be good, because we have been trained to do so, or because it has been the custom, and not because those rules were known to be based upon science, or enforced by the supreme authority of irresistible energy acting in accordance with unchangeable laws. But a change is coming: "natural knowledge, in desiring to ascertain the laws of comfort, has been driven to discover those of conduct, and to lay the foundations of a new morality" (T. H. Huxley, "Lay Sermons," p. 11).

Notwithstanding that morality is very abstruse and complex, and largely conventional and conditional, there exist sufficiently definite scientific rules of right and wrong behaviour for all men. Moral rules are practical expressions of the great laws of science in accordance with which the energies of Nature govern the social conduct of all living creatures; the chief of them may be briefly stated as follows:—(1) To obey all the laws of Nature; (2) To do the greatest good; (3) To preserve our lives and health; (4) To do unto others as we would have them do unto us; (5) To continually improve ourselves and others; (6) To prefer truth to error; (7) To consider beforehand the consequences of our acts; (8) To estimate all things according to their real value, and not sacrifice the greater to the less; and (9) To proportion the fixity of our belief to the strength of the evidence. The three last of these rules constitute the essence of wisdom and of a good judgment; and we know by general experience that a grain of wisdom is often worth an ounce of cleverness, a pound of physical energy or of blind sentiment. The rules of man's conduct towards other animals are substantially the same as towards those of his own kind, due allowance being made for the difference of degree of sensitiveness of each animal to pain and pleasure. To "be good and do good" is the most comprehensive statement of morality; and the whole of the rules of moral conduct may be summed-up in the words "obedience to law." It is seen, and it will be seen, more and more true, that "the safety of morality is in

the keeping of science" (Huxley), because the true basis of the efficacy of moral rules lies in the unchangeable laws of science and the irresistible energies which enforce them. Although the rules of morality are simple, the proper application of them is often very difficult because of the abstrusity and complexity of the cases.

The chief reason why the whole of the foregoing rules are based upon the great principles of science is because nearly all the phenomena of human conduct consists of causes and effects. All moral rules require more or less scientific knowledge on our part to enable us to intelligently obey them; and the fact that the successful application of them is largely dependent upon intellect shows that the rules have a scientific basis. Moral rules are inseparably related to the properties of things, and of living creatures, and are founded upon the powers and laws of dead and living structures. Even the correct actions which we automatically and blindly perform are related to the properties of the nervous tissue, the physical and chemical changes in which stimulate us to perform them; they are essentially dependent upon the physiological properties of irritability and reflex action, as well as upon the properties of the bodies and substances which excite them.

"The rule of morals is the same for all men" (Cardinal Newman, "A Grammar of Assent," 1870, p. 415). The rule of obedience to energy and law necessarily follows from the infinitely great truth, that all things are governed by omnipotent powers in accordance with immutable laws, and all the others necessarily follow from it. Like science is a great hierarchy of principles, each succeeding one being less comprehensive, more complex, and included in the one which precedes it (section 14), so is morality a system of rules of different degrees of comprehensiveness and complexity, and related to each other. The chief idea which pervades all rules of moral and social conduct is the prevention of avoidable pain or discomfort to others as well as to ourselves. Even in the conduct of war there are international rules to be obeyed for avoiding or preventing the maximum of cruelty, for instance, the use of explosive bullets is forbidden, the bombardment of hospitals avoided, the bearers of flags of truce are not to be fired upon, etc.

As nearly all moral rules require suitable knowledge to enable them to be practically applied, living in strict accordance with them is a difficult matter, and not to be accomplished by ignorant or idle persons: "wide is the gate and broad is the way that leadeth to destruction, and many there be which go in thereat; because straight is the gate, and narrow is the way which leadeth unto life, and few there be that find it."

61. First Rule—Obedience to Energy and Law.

Obedience to the great powers of Nature is the first and most comprehensive of all moral rules, because it is the basis of, and includes, all the

rest; in a similar manner the rule to do the greatest good practically includes those which follow it. "What I have first to ascertain is the laws under which I live. My first elementary lesson of duty is that of resignation to the laws of my nature, whatever they are" (Cardinal Newman, "A Grammar of Assent," 1870, p. 340); but we must know those laws before we can best obey them. "Fear God and keep his commandments, for this is the whole duty of man." "The first rule of practice is to do all things at the right time and in their proper place; to proportion the means to the ends and the ends to the means; above all, to know what is possible, and to confine one's endeavours within the limits of the feasible" (J. J. Sylvester, F.R.S., Memoir, *Proceedings of the Royal Society*, May, 1898, p. xvi). The love of law and full obedience to it is the purest religion and morality. When we observe the universal and complete obedience of the entire universe of inanimate bodies and of living plants to omnipotent energy, and that our organisms are entirely composed of them, we need not be surprised that we also are compelled to obey universal energy, and that might is right when omnipotent power compels.

Obedience to energy and law, and fulfilment of duty, constitute the essential principle of all morality, and are characteristics of all strictly scientific and moral persons. In a perfect community or nation, each separate individual is subordinate to the whole, each has to serve and be served; all men therefore are servants, and all men are masters, but ignorant persons and lawless ones, whilst wishing to command, often refuse to obey. As a subordinate has to obey his superior because the latter is stronger, so has each man, community, and nation, to obey all the powers of Nature; it is natural energy which really punishes and rewards men. Natural energies are incomparably stronger than all mankind; there is no outwitting them so as to do the wrong and avoid the punishment, or to gain the pleasure and evade the pain; they are inflexible and unchangeable; they never forget nor forgive, for instance, in the late strike of engineers, the workmen disobeyed the laws which govern society, and they with their abettors were punished by great loss of power and of several millions of pounds. "Neither is it possible for any power to burst the chain of causes; nor is Nature to be overcome, except by submission" (Lord Bacon). All law appears to be natural, and we know of no region of phenomena or of truth which is not in accordance with it, but unscientific persons often refuse to admit this, thus according to a late popular Congregational minister, "the will is independent of natural law" (see p. 505); according to another, "in every genuine volition we have a phenomenon not law-determined, law-regulated" (see p. 330); and Bishop Temple stated that "Revelation asserts its right to set aside the uniformity of Nature to leave room for a direct communication from God to man" ("The Relations between Religion and Science," 1885, p. 194); similar lawless expressions have been made by many other religionists. "Where law ends tyranny begins" (W. Pitt), and history has abundantly proved that where ignorance of law exists, violence is apt to occur.

Men are taught obedience to energy and law by the example of all inanimate things; by the countless myriads of celestial bodies, by the rocks, the rivers, the winds, tides, etc., all of which strictly obey the energies and laws of gravitation, motion, heat, light, etc. Who are usually the most obedient to natural law, usually those who best understand it, those who have been trained to detect its existence in everything. Who are the least obedient to it, those who least understand it, and those who believe in supernatural interferences. Ignorance of natural law is not entirely confined to criminals, nor to those who are ignorant of subjects generally; all men are usually the most incredulous and lawless in the subjects of which they know least. Untrained men and women frequently disobey natural laws by tampering with selfish desires, until, like the moth which flies into the flame of a candle, they are permanently injured. Insane persons are lawless, and mental lawlessness often produces insanity.

> "Possessions vanish, and opinions change,
> And passions hold a fluctuating seat;
> But, by the storm of circumstances unshaken,
> And subject neither to eclipse or wane,
> Duty exists."
>
> —*Wordsworth.*

All morality is performance of duty, and all duty is based upon law; "whatsoever a man knows to be his duty, and yet refrains from doing, be the thing ever so little or the temptation ever so great, is a deadly sin, and that independently of all written laws whatever; deadly, for either duty has no meaning at all, or its significance is immense and eternal" (Huxley, "Lay Sermons on Christianity," 1841). Duty is a nobler motive than pleasure. It is a duty to rest, and "to doe the next thynge." "Good example is better than good preaching." "The law is good if men use it lawfully" (Timothy, chap. i). He who is most obedient to law is usually the safest from attack, especially if he is known to be strong:—

> "He that respects himself is safe from others;
> He wears a coat of mail that none can pierce."
>
> —*Longfellow.*

> "To say well is good, but to do well is better;
> Do well is the spirit, and say well is the letter;
> If do well and say well were fitted in one frame,
> All were won, all were done, and got were all the gain."
>
> —*Ibid.*

> "He who serves well and speaks not, merits more
> Than they who clamour loudest at the door."
>
> —*Ibid.*

Every man has a moral right to be allowed to do his duty and the greatest good to all. "The path of duty is the way to glory" (Tennyson). Ability to perform a good act is largely an obligation to do it. The first

duties of life are usually the nearest ones; the practice of morality is more important than that of obedience to untruthful beliefs, and a man who is not moral cannot be truly religious. A good moral character, or general obedience to law, is of greater value and importance than the possession of knowledge, but it cannot be fully attained without the aid of it. By implicitly obeying universal laws, we do the greatest good in cases too comprehensive for our mental powers to perceive and value; in such cases natural powers sum up the balance of essential good for us, and indicate the path of duty usually by compelling us to follow it.

We are in a reasonable degree happy only when we sufficiently obey natural laws; many a man has succeeded in life and in obtaining happiness by implicitly obeying, as far as lay in his power, the universal powers and laws of Nature, and thus securing the assistance of those energies and influences in carrying out his designs; and the well-known question, "if God be for us, who can be against us?" may therefore be appropriately paraphrased by asking, if the omnipotent powers of the universe support us, who can overcome us? At every stage in life we have usually only to train and adjust our minds, bodies, and environments to suit any proper object we have in view, and persevere in order to accomplish it. This great practical rule of life is shown by every one of the successful undertakings of men, whether it be in the founding of empires, the subjection of savage races, the construction of railways, canals, telegraphs, steam-engines, great bridges, ships, or the tiniest watch. In every one of the multitudinous occupations of man, whether it be in theology, science, art, or industry, he must, if he is to succeed, obey to the fullest possible extent the powers and laws which govern the universe, his calling, and himself—*i.e.*, he must understand the fundamental basis of his occupation.

Obedience to natural energy and law by the aid of scientific knowledge is gradually opening out to our view an endless vista of power, pleasure, happiness, and goodness, far transcending all imaginary ideas of eternal pleasure in heaven, and immeasurably more rational because it is real. As there is less necessity for imaginary pictures of angels and cherubims, visions of devils and hell by artists, now that photography gives us truthful views of real existences, and mutoscopes reproduce their movements, and phonographs their sounds, so will there be less need for untruth or mental deformity of any kind when scientific truth and beauty are better understood. As the performances of science have more than exceeded the widest expectations of the poets to "put a girdle round the earth in fifty minutes," so are they gradually transcending the promises of theologians of giving to man "a new heaven and a new earth." It has been truly said "man must have something to worship," and science is gradually providing it in the omnipotence, omniscience, omnipresence, and beauty of infinite truth as an object of human devotion.

The subject of this section might be very considerably enlarged, but sufficient remarks on it have already been made in the sections on motives, knowledge, ignorance, truth, etc.

62. Second Rule.—To Do the Greatest Good.

This rule requires us to make the best use of all our powers, and is largely synonymous with, and implied in, the first one; it includes two lesser ones, viz., "of two evils choose the least," and "of two good things choose the best," and each of these requires the ability of valuing many incommensurable things to enable us to obey it. It is the rule of life which gives us greatest peace; it does not give us perfect peace, nor is it best that it should, because all men require more or less pain and violence to stimulate them to action; it, however, makes life worth living, more so than by following any other rule. If you wish to be happy when you are old, do the greatest good you can whilst you are young:—

> "I dare do all that may become a man;
> Who dares do more is none."
>
> —*Shakespeare.*

Many a one will ask: What has mankind done for me that I should devote my life to doing others good? The reply is, everything; each one may truly say it is largely through my predecessors and contemporaries that I exist and am what I am. Mankind have brought me into being, reared me, educated and trained me, provided me with food, firing, clothing, a dwelling, means of travel and enjoyment, with roads, railways, and steamships, with hourly information from all parts of the world, with ways of communicating with my friends by letters, telegrams, etc., etc. My fellow-men bring me food of all kinds, wine, fruit, and a multitude of other things which are either useful or enjoyable from all parts of the world, and the whole of them at a fraction of the cost at which I could produce them myself, and many of them I could not produce at all; the least, therefore, I can do is to try to do good to them in return. Each man, however, is compelled to do good to others, whether he is willing or not, in the act of earning his living whilst producing or doing something which his fellow-men require; also by rearing a family, and in many other ways. We have largely reached the period when every necessary of life will become abundant and readily accessible to all men, we shall then not need to employ violence or fraud to obtain them; and it has been said that even "tigers would be sociable were animal food as abundant and accessible as vegetable food" (G. H. Lewes, "Problems of Life and Mind," 1874, vol. i, p. 175). All living things do good to us in some way or other; domestic cattle devote the whole of their lives to making flesh out of grass, etc., thus providing us with animal food, leather, bones for making buttons, phosphorus, etc.; and tens of thousands of different kinds of animals and plants provide something or other of service to us.

The ways of doing good increase, both in number and variety, with the

progress of civilisation. The time appears to be near when we shall, by means of telectoscopes, cinematographs, and memory machines, both be able to see and to hear not only what is going on in distant places without the need of travel, but also what has occurred at previous periods; by adding to our data of inference we shall also be able to predict more of the future. Every increase of facility of communication between man and man, nation and nation, tends to increase altruism; and if we could instantly transmit thoughts to any distance without the aid of wires, or men and merchandise rapidly through the air, both of which are gradually coming, it would still further help to promote universal brotherhood and peace. It is by means of such extension of discovery and of invention rather than by unscientific schemes of "liberty, equality, and fraternity," "nationalisation of the land," "eternal pleasure in heaven," etc., that socialists and others may hope to attain greater happiness. Money is becoming more plentiful, and its relative value to that of knowledge is diminishing.

"There is only one great object in the world which deserves our efforts, and that is the good of mankind" (De Tocqueville). "The best and noblest office which one human being can perform for another is to give him the means of self-improvement" (H. Taylor, "Morality of Nations," 1888, p. 255). We may truly say that man's pride, his passion, and delight, should be to do what's good and think what's right. "That which is supreme above all is the duty voluntarily to desire the highest good of all men" (H. Porter, "Elements of Moral Science," 1885, p. 394); but the most comprehensive reason for doing good is to act consistently with universal energy and law towards all things, whether living or dead. All things are related to all, and are united together by universal system, law, and order, even the stars give us peace; natural knowledge has too far advanced to require any supernatural or ultra-rational explanation of goodness. Nations are becoming so united to each other by the bonds of science, that international war is fast becoming so much like civil war that mankind will unite to prevent it.

"Knowledge is good, but virtue is better" (J. A. Symonds, M.D.); and to this might be added that notwithstanding the undue, and oft-times irrational, glorification of faith, dogma, and ignorance, the most perfect virtue requires adequate knowledge. Plato, 427 B.C., maintained that the highest idea is good, and he anticipated "the golden rule"—"thou shalt not take that which is mine, and may I do to others as I would that they should do unto me" (Jowett, Trans. v. 483): Isocrates also at about the same period said, "you should be to others what you think they should be to you," and this rule was afterwards adopted by Christians. We cannot largely "love our neighbours as ourselves" until there is considerable similarity of fundamental rules of conduct on each side, and most of our differences are harmonious ones. Notwithstanding that "God hath made of one blood all nations of men who dwell on the face of the earth," there are hereditary and racial differences, the ignorant and the

intelligent never did fully agree and never will, the limited powers of human nature prevent it, nevertheless we may encourage harmony, whilst conflict and difference in certain forms and degrees remain necessary conditions of progress. The strongest proof of love to all men is by making sacrifices in doing that which permanently most improves them; the ways, however, of doing good are almost infinite in number and variety. "The dignity of every occupation wholly depends upon the quantity and the kind of virtue that may be exerted in it" (E. Burke). Altruistic feeling conduces to greatness of mind, and greatness of mind conduces to altruistic feeling by a process of action and reaction :—

> "Whatever freedom for ourselves we claim,
> We wish all others to enjoy the same,
> In simple womanhood's and manhood's name!
> Freedom within one law of sacred might—
> Trench not on any other's equal right."
> —*Thomson.*

Living for others is the Buddhist plan of salvation (W. S. Lilly, "Ancient Religion and Modern Thought," 1884); "even Christians may learn something from Buddhists" (A. Scott, "Buddhism and Christianity," 1890). "Greater love hath no man than this, that a man lay down his life for his friends." Goodness is better than power, knowledge, or wealth, but it usually requires a portion of each to make it effectual. "To be good to one's fellow-man is the best religion" (Abdul Hamid, Sultan of Turkey). "That which is not good for the swarm is not good for the bee" (Marcus Aurelius Antoninus). "To him that knoweth to do good, and doeth it not, to him it is a sin" (James iv, 17); but no man is entirely sinful nor entirely holy. Altruism is the best remedy for old age; there is nothing which has so great a sustaining power in affliction as the retrospect of a good life; but goodness is not cheap, and such a life cannot be attained without much personal sacrifice. Goodness is the perfection of wisdom, because it is knowledge and power applied and used in the wisest manner. The amount of good which even the best men do does not usually increase in the same direct ratio as their possessions; it usually increases in a smaller proportion than wealth. In the earliest periods all men had to struggle for life; later for power, still later for property and money, now more for knowledge, and in future for goodness; formerly it was of greater urgency to raise and feed human beings than to educate them, and at the present time men must obtain sufficient income upon which to exist before they can train their minds; usually the two actions advance side by side together; the world must be more fully populated before general and cosmopolitan altruism can be fully developed. "The time will come when a man shall care more that he wrongs not his neighbour than that his neighbour wrongs not him" (Emerson); then will really selfish ideas have largely diminished :—

" When each shall find his own in all men's good
And all shall work in noble brotherhood."

" That love for one, from which there does not spring
True love for all, is but a worthless thing."
—*Mrs. Browning.*

" Self-love forsook the path it once pursued,
And found the private in the public good."
—*Pope.*

Whilst nearly all virtuously great men have willingly laboured and suffered for the good of their fellows, there are multitudes of persons who selfishly want to save themselves by the sacrifice of others, or who make it their study how to get others to work for and maintain them; multitudes also who gain a living, not by personal usefulness, but by the death of some one who has laboured for them; it is, however, " better to work than to wait for dead men's shoes," because useful labour develops goodness. Whenever there is any pleasure to be obtained for little or nothing, there is always a multitude of persons scrambling for it, and some are so much in the habit of wishing to reap where they have not sowed, that it is painful to them to have their conduct in the least degree questioned; the scramble for unearned wealth and for eternal happiness, each arise from personal desire; the absorbing idea of a sectarian convert is not how much good can I do for others? but " what shall I do to be saved? " Real selfishness consists not so much of care for one's self as in neglect of our fellow-creatures.

Good conduct consists of good thoughts as well as good actions, to think and act rightly towards every one; it has regard to the future as well as to the present, it conforms to the law of evolution and to that of causation; to future improvement as well as to maintain our present state; it imparts the greatest happiness to all, not necessarily the most immediate pleasure, because time is necessary for all things; many of our good deeds bear fruit only after our death. " It is more blessed to give than receive," provided that what we give is our own, and that the gift will be more productive of good than of evil. " When a man begins to get he should commence to give." Goods are not good unless we do good with them; money, and even knowledge, have by misapplication been a curse to many men. Goodness of conduct is identical with perfect obedience to universal laws :—

" Whenever a noble deed is wrought,
Whenever is spoken a nobler thought,
Our hearts, in glad surprise,
To higher levels rise."
—*Longfellow.*

The sphere of useful action is so vast and varied that there is sufficient useful labour for all human beings for infinite time to come; it is a secondary question what kind of good a man does, and he should be allowed a large freedom of choice and action. Doing good is not so much a question of what men possess as how they use it, and it matters but little how much knowledge, fame, money, property, land, social influence, or political power we acquire, provided we use it well. "Every advantage has some disadvantage," and all courses of good conduct have more or less of what we term "evil" associated with them; in such cases we usually encourage or discourage them according to our estimation of their relative amounts of good and "evil" effects. That "the end sometimes justifies the means" is a common belief of the greatest men; and to do the lesser "evil" is often the only course we can take in life; but which is the least "evil" or greatest good is often very difficult to determine, and largely depends upon all the circumstances of the particular case; in many instances, it is decided for us by the universal process of compulsion.

Goodness is the sum of all the virtues; wisdom and goodness constitute the only true morality, "'tis only noble to be good" (Tennyson). Good society consists of good persons, not necessarily of rich or even of pious ones; it matters but little what a man's occupations, possessions, or professions are, provided he is a good and useful member of society. We estimate each other's goodness, not so much by what good we do or promise to do, as by what we fail to do, largely because we expect the former as a matter of course, and because the latter gives us pain and makes a more permanent impression upon us. "Men's evil manners live in brass, their virtues we write in water" (Shakespeare). Men notice each other's failings more than their excellences; for the latter inquire of their friends; and for the former, listen to their enemies. As far as we dare it is wise to forget the worst and recollect the best of all men; we should not complain unless we can do some good. In consequence of personal defects, "the good that I would do, I do not; and the evil I would not, that I do"; but "it is never too late to mend."

"It is too late! Ah, nothing is too late
Till the tired heart shall cease to palpitate.
Cato learned Greek at eighty; Sophocles
Wrote his grand Œdipus, and Simonides
Bore off the prize of verses from his compeers,
When each had numbered more than fourscore years;
And Theophrastus, at fourscore and ten,
Had but begun his 'Characters of Men.'
Chaucer, at Woodstock with the nightingales,
At sixty wrote the 'Canterbury Tales';
Göethe, at Weimar, toiling to the last,
Completed *Faust* when eighty years were past;
These are, indeed, exceptions; but they show

How far the gulf-stream of our youth may flow
Into the Arctic regions of our lives,
Where little else than life itself survives."

—*Longfellow.*

"For age is opportunity no less
Than youth itself, though in another dress."

—*Ibid.*

In the ordinary aspect the lower we descend, both in the animate and in the intellectual scale, the more altruism appears to diminish and selfishness to increase; thus the lower class of animals appear the most selfish ones, plants seem more selfish than animals, and if we may so apply the term, inanimate powers and substances appear more selfish than either; thus hurricanes, floods, avalanches, lightning, etc., are entirely relentless towards all living things. The slaughter of men in war is small in comparison with that of debilitated persons by the cold of winter, by microbes, and especially by the mistakes of ignorance. In the most comprehensive scientific view, however, Nature is an immense system of altruism, perfect throughout, and the greatest good is the result of each and every action; natural powers practically compel, not only individuals to sacrifice themselves for others and for the good of the community, but also communities to submit to universal law and order; and even human life is compelled to yield to the greater good of maintaining the mechanical balance of terrestrial energies. There is the further consideration of not only what is good for all things now, but also for the future; and the fact that a great temporary good is less than a small but eternal one, and it is this further consideration which is most beyond our comprehension and most disturbs our power of valuing moral actions. The complexity and profundity of Nature altogether surpass the power of man even to imagine, and the question of what is the greatest good for the future is left out of consideration by us in direct proportion to our ignorance of fundamental principles, but the mechanical energies of Nature settle it for us, and "there is a providence which shapes our ends, rough hew them as we may," thus we all have to die in order that future human beings may live. It is in consequence of natural influences that egoism and altruism act and react upon each other, and prevent either of them going to an extreme.

Duty is what a man ought to do if it is within his power, but in many cases what is his duty can only be fully ascertained by means of a long and difficult investigation of all the circumstances of the case, and we are frequently compelled to decide without it. In every instance duty is included in obedience to law, and is limited by human ability; in sudden emergencies more particularly, where men have but little time to think or act, they can only do the best they are able; for instance, a man who was falling down a pit, to prevent his killing others, had only time to shout "clear out below." There is no absolute duty, all duty is relative, and dependent upon circumstances, therefore, to fully determine the course of

duty in complex cases usually involves, not only the collecting of all the evidence, but the weighing or valuing numerous circumstances and groups of them; many of which, being incommensurable, their values can only be guessed, as is frequent in the case of a verdict given by a jury. Natural influences often save men the trouble of measuring their duties by compelling them to act; thus, if a man's life is in danger he must run at once; he has no time to investigate.

The question, what is the most important duty is often a difficult one, and if there is not time to actually determine it, it has to be guessed; that which lies directly in the way of a man is usually the most important he can then and there do; and if he is the only person able to perform it, he must do it whether it costs him little or much, or gives him pain or pleasure. When a man is specially qualified to do some highly important unremunerative work for public good, he should be allowed to do it, and if necessary he should be assisted in the undertaking, and be liberated from the duty of helping his fellow-men in other ways. Those who occupy all their time in doing good in one way cannot occupy it also in another. The highest type of man is he who does the greatest good; some prefer to help individuals, others to help "causes," and the wider-minded to promote principles; it is a good rule to help all deserving objects as far as we can.

The most practical guide of life is not what we think a man "ought" to do, but what he "must" do; and the former frequently has to yield to the latter. In obedience to the influences within and around him, man enters the world and leaves it by compulsion; bad men must be born, good men must die, and all must submit to the risks and changes of life; criminals must commit crimes, and upright men must restrain them. It is only when what we consider to be our duty is really consistent with the laws of causation, continuity, and evolution, that we are allowed by our environments to perform it. "The path of duty is the path of safety," because it is supported by omnipotent energy and law. We frequently, in the ordinary sense, "do that which we ought not to do, and leave undone that which we ought to have done"; *i.e.*, we are caused by the influences around and within us, to do that which we believe to be wrong, and notwithstanding that we are actually compelled to do it, it lowers our character, our mental and moral status, because we are expected to be able to foresee and provide for the contingency; thus even when through absolute compulsion a man breaks his promise, we have, as it were instinctively, less trust in him in the future. Altruism is often more imperative than individualism; for instance, when the tax-collector calls, the individual must pay, whether it is convenient or not. It is in some cases better to lose our friends than neglect our altruistic duties. Pascal, having been asked why he named the authors from whose works he had extracted objectionable statements, replied—"If I were in a town where there were a dozen fountains, and I knew for certain that one of them was poisoned, I should be under an obligation to tell the world not to draw from that fountain; and,

as it might be supposed that this was mere fancy on my part, I should be obliged to name him who had poisoned it, rather than expose a whole city to the risk of death" (Nasmith, "Makers of Modern Thought," 1892, vol. ii, p. 111); similar altruistic motives, but founded upon a false basis, viz., that of "saving souls from hell," have been the cause of numerous cruelties of sectarians towards each other.

Man, in common with all other animals, is essentially a creature of circumstances; in accordance with the great law of causation he is physiologically compelled to be active in body and brain, not only to preserve his own health and life, but also that of others, and for the benefit of those who come after him. In submission to the great principles of continuity and evolution, he is usually obliged to leave the world a little better for his having lived in it; he has inherited an increase of advantages, and must in most cases leave a still further increase to his successors. As he is related by the universal bond of continuity to all other men, and all his actions influence others throughout all time and space, he must do good now to all men, and wait for his reward whether he is willing or not. It is only in a small proportion of cases that he can carry out the "business rules" of "ready money," "quick returns," etc.; he is compelled to "give credit," "even to the third generation" in some cases; for instance, if he plants acorns, they require many years to become full-grown oaks; if he discovers great recondite truths, they require a still longer time to produce their full effect, that of the law of gravitation by Newton has required several hundred years, and is still growing; the greater the essential importance of the labour the larger usually is the goodness of the effect, and the longer the period of time required for it to grow; oaks do not grow as rapidly as willows. In many cases he must forgive his enemies, even to ten times ten.

It is more important to live virtuously than to live long; a man who can do no good to anyone, or who does much more harm than good, if there be such a one, is unfit to live. He alone is highly virtuous who makes good use of all his powers; nothing which is useful should have more rest than is needful; money, to be useful, must be kept moving. To be able to do the greatest good requires good hereditary inclination, the best training, knowledge of what is good, judgment in selecting the best, and energy to carry it out. The proper time to do good is now, "now is the accepted time, now is the day of salvation"; we should "work whilst it is day, for the night cometh when no man can work." Provided a man does all the good he can to others as well as to himself, it matters little who or what he is, or of what occupation, nor whether he does it by means of his head or his hands.

Efficiency is largely necessary to goodness, both in dead and in living things; that is good which is most efficient for its purpose; we do not construct a wheelbarrow with the same degree of nicety as we do a watch. Doing good requires ability, the same as any other occupation; and usually it is only by improving ourselves that we become best fitted to do good to

others. The life of a man who is able to do cosmopolitan work is usually of much greater total value than that of ordinary persons, and may therefore be justifiably devoted to such kind of employment; we must not hastily convert philosophers into tradesmen; nevertheless, each man is good in his sphere; we cannot all be great. A single important discovery, such as that of electro-magnetism by Oersted, largely benefits all mankind; and so in a less degree does wise cosmopolitan expenditure of a large sum of money.

A desire to do the greatest good is the most sustaining motive of moral conduct, because it is the least changeable and the least dependent upon expectation of personal gain; it is only by habitually disregarding ideas of personal advantage that the most difficult labour can be continually performed. When men acquire more comprehensive knowledge, they will not so much require great personal rewards to induce them to become moral.

The duty of doing good is a very imperative one, and we often perform it unknowingly, even in our most selfish actions, thus the avaricious man must leave his money when he dies for some one else to usefully invest or to spend; and he who spends money wastefully is not usually allowed by his fellow-men to do much harm with it; no men are allowed to do much "evil" without being restrained or punished. The duty of doing the greatest good is so imperative that by most moralists it is conceded that under compulsion, and in specially exceptional cases, even veracity may be sacrificed and an untruth told in order to prevent or avoid a great evil, or to do a much greater good.

The idea of treating the duty of doing the greatest good as being of more intrinsic importance than that of securing immediate reward is usually considered "unbusiness-like," and in the ordinary narrow aspect it really is so, because it is often in advance of the time and immediate circumstances; but the narrow, practical idea of "an eye for an eye, and a tooth for a tooth" disobeys the great principle of evolution, because it does not provide for improvement; according to the wider view, we are compelled to give where we have not apparently received, and to trust in the great powers of Nature to gradually work out the greatest good effect; as we do not suffer the entire painful consequences of our mistakes, and others share them with us, so also we must not expect to reap the entire advantages of our good actions, but must allow others to share them; and in this way the principles of evolution and of equivalency of action and reaction are obeyed. We must do good to those who succeed us, whether we are willing or not, and the argument that "posterity has done nothing for me" is often only a sophistical evasion of duty. It is partly this incessant conflict of narrow ideas with wide ones which excites continual strife, and leads to improvement and progress.

In a moral aspect, duty comes before pleasure. We all know that there are painful duties and pleasurable ones; but in most cases the performance of duty is attended by a mixture of pleasure and pain in various

proportions. Good and necessary work is often done from a sense of duty alone; for instance, it is a duty and not a pleasure to watch the sufferings of a dear relative without being able to render relief, and in case of death, to bury the body. The very highest class of work is sometimes done from a sense of duty alone under circumstances of great labour and trial. If it happens to be a man's duty to work for others without payment, and there are no other persons to do the duty, he must do it if he is able; thus in cases of epidemics both medical men and ministers of religion, "sisters of mercy," etc., have to perform such functions; scientific men also do a great amount of difficult work for which there is no pecuniary payment.

All acts of duty may be conveniently divided into two classes, viz., duty to self, and duty to others; the former are often termed selfish, and the latter altruistic. Those of life are usually a mixture of the two, society could not exist unless each individual did his duty towards himself and towards others, and the social condition of mankind is maintained and evolved, partly by selfishness and partly by altruism. Each man must not only try to succeed for his own sake, but must help others to succeed and be happy, "each for himself, and each for all." The selfish abilities may be conveniently classed as including industry, economy, perseverance, courage, health, temperance, self-control, etc., and the altruistic ones, as including veracity, honesty, conscientiousness, justice, fidelity, sympathy, kindness, charity, affection, love, etc. Selfishness commands each man to get all he can and give as little as possible, whilst altruism requires him to help all men. "No man liveth to himself, or dieth to himself":—

> "So two consistent motions stir the soul;
> And one regards itself, and one the whole.
> Thus God and Nature linked the general frame,
> And bade Self-love and Social be the same."
>
> —*Pope.*

> "Remember man, 'the Universal Cause
> Acts not by partial, but by general laws';
> And makes what happiness we justly call
> Subsist not in the good of one, but all."
>
> —*Ibid.*

There is a hierarchy of virtue for each man, viz., first good to self, then to family and friends, and last and widest, to all living creatures; human life is such that individuals must suffer for the sake of a family, their fellow-citizens, and all men; families must suffer for the good of the larger community; communities for the sake of the nation; and nations for the benefit of each other:—

> "As the small pebble stirs the peaceful lake;
> The centre moved, a circle straight succeeds,
> Another still, and still another spreads;

> Friend, parent, neighbour, first it will embrace;
> His country next, and next all human race;
> Wide and more wide th' o'erflowings of the mind,
> Take every creature in of every kind."
>
> —*Ibid.*

The love of self usually and properly takes precedence of the love of all, because if a man neglects to help himself he will soon be unable to assist others; the more also we improve ourselves the less we need assistance, and the better able are we usually to do wider good, because strength for good grows greater by habit, and at an accelerated rate. Each man is frequently placed between two difficulties, a kind of moral Scylla and Charybdis, *i.e.*, by attending too exclusively to his own business and too little to public welfare, he tends to produce and suffer from bad government; whilst on the other hand by neglecting personal affairs to attend to public ones, he runs the risk of becoming bankrupt. It is sometimes difficult to decide what to do in such cases, but the question is often settled, either by doing that which appears to be the most pressing or important, or by doing that for which a man is best fitted, for it is better to be a good chimney sweeper than a bad poet. Whilst it is a duty of each person to do some public good if he is able, it is equally that of the public to assist if necessary those who perform gratuitous cosmopolitan labour, whilst those who manage philanthropic institutions are entitled to a living, the appropriate reward of labour and time expended is money, and of genius, fame and admiration.

As the love of self is a primary duty, even unintelligent persons, except the most ignorant ones, usually manage to obtain sufficient knowledge to provide for their own immediate wants, though frequently not sufficient to predict the future consequences of their actions. Ignorant persons are often those who do the least good to others and expect the most to be done for themselves, and frequently fail in life and become parasites upon those who have greater wealth or larger knowledge. Selfish individuals, families, and nations, often succeed for a time and then decline; "the hand of a selfish man is raised against that of every man, and every man's hand is raised against his," and as all mankind are nearly always stronger than one man, the latter is in nearly all cases finally crushed out. Undue selfishness always indicates ignorance of the true nature of human life and happiness; a selfish man is like a carnivorous animal; and like the large carnivora are rapidly being exterminated, so in due course of time when knowledge is greater will selfishness be diminished.

> "While man exclaims, See all things for my use!
> See man for mine! replies a pampered goose;
> And just as short of reason he must fall,
> Who thinks all made for one, not one for all."
>
> —*Pope.*

Selfishness, or an undue desire for personal enjoyment has always been

considered a great defect, and shows itself in a multitude of ways, for instance—the greed of money in men; the undue desire for dress and personal adornment by women; the craving for drink by the drunkard; the habit of over-eating by persons in "well-to-do circumstances"; the pursuit of sensual pleasures by profligates; the waste of life in frivolous occupations by young persons of both sexes; the neglect of the rights of pedestrians by cyclists, etc. Selfishness and cruelty are very closely allied; we see it in the cruel treatment of industrious workmen by trade unionists; the disregard of the lives of their fellow-men by miners, who indulge in smoking tobacco in "fiery" coal-pits; the neglect of the sufferings of the sick and afflicted in hospitals and houses by laggard workmen who require "steam-hooters" to call them to work; the irrational desire for eternal enjoyment by religionists, notwithstanding that it ultimately produces sectarian hatred, "religious wars," and atrocities.

In obedience to the great energies of Nature, and in accordance with the law of action and reaction, what we term "evil" actions and good ones control each other. The lover of truth is everywhere confronted by the advocate of untruth; the honest trader is influenced by the dishonest one; the intelligent man by the unintelligent one; the industrious workman by the idle one; the scientific by the theologian, and all are compelled by those energies to move forwards, side by side, in the endless stream of progress. No one ever benefited his fellows without exciting some opposition; Jesus Christ suffered crucifixion rather than not propagate valuable moral lessons for the good of mankind.

Great selfishness is a form and certain sign of ignorance, because the unduly selfish person cannot perceive that by his conduct he defeats his own object. Many children, through defective training, are extremely selfish, more like little savages than civilised creatures; "the selfish boy who would have all, lost all." It is usually more selfish to be behind the age than in advance of it, because the latter requires more self-denial and exertion; the former, however, is often followed by the greatest ultimate punishment. The selfish man, when he gives, does so with one hand, in order to receive a greater advantage with the other; it is not pure kindness to make a small sacrifice in order to do good to a poor friend, and expect to receive a much larger advantage in return, it is trading in friendship. Much of what is called charity is taking from one person to give to another. There are many forms of selfishness, but there cannot be greed of wisdom or of doing the greatest good, simply because to be too wise or too good is impossible.

"Oh, if the selfish knew how much they lost,
What would they not endeavour, not endure,
To imitate as far as in them lay
Him whom his wisdom and his power employs
In making others happy?"

—*Cowper.*

"The candid observer who surveys the ways of men in the state of modern civilisation cannot choose but confess that many of their most cherished aims are unworthy of the zeal and energy with which they are pursued. They may be summed up compendiously in the words 'to get on in the world.' Without doubt it is a good and excellent thing that there should be so much desire and energy displayed in straining for an aim of some sort, were there not, no progress would be made; but it is often a grievous thing as regards the individual and his family that his aims and work are not more consciously and systematically altruistic; that he does not realise plainly that he is a member of the social body whose individual functions are subordinate to the welfare of the whole. His practical religion being to get money and enjoy it, and his professed religion being to despise the things of this world, his actual aim is to serve two masters who require quite opposite services, holding to the one without despising the other" (Maudsley, "Pathology of Mind," 1879, pp. 133, 134). Love of self and love of others are rarely balanced in the same individual; acting upon "business principles" and doing the greatest good are often incompatible. Devotion to useful work good to all is a characteristic of all really great men.

> "He's true to God who's true to man, wherever wrong is done,
> To the humblest and the weakest, 'neath the all-beholding sun;
> That wrong is also done to us, and they are slaves most base
> Whose love of right is for themselves, and not for all their race."

Neglect of others, however, is not always a matter of choice, but often of necessity; the great bulk of mankind must be selfish, whether they will or not, because, in a great number of cases, it is absolutely necessary for the preservation of life, avoidance of bankruptcy, and various other evils. It is rare to find a man who does not want "a return" of some kind for his gifts or patronage; to "kill two birds with one stone," by doing good to himself and another simultaneously, and this is largely true of the trader in knowledge as well as of the trader in merchandise, and it is often a greater good to benefit two persons than only one. The form of "return" may be various, it may be by direct advertisement, as having assisted some deserving institution; his name must be kept before the public in some form, as lecturer on some popular subject, by writing popular articles, or in some one or other of the great variety of ways of being useful without too great expenditure of time or intellect. A completely altruistic man, who devotes himself to doing good to mankind in general, purely from a sense of duty, is probably as rare as a perfectly honest man. Meanwhile, altruism is progressing side by side with selfishness and with new knowledge; "it is becoming year by year a tacitly-received doctrine that the rich should not, as in bygone times, spend their lives in personal gratification, but should devote them to the general welfare. Year by year is the improvement of the people occupying the attention of the upper classes. Year by year are they voluntarily devoting

more and more energy to furthering the material and mental progress of the masses. And those among them who do not join in the discharge of those high functions are beginning to be looked upon with more or less contempt by their own order. This latest and most hopeful fact in human history—this new and better chivalry—promises to evolve a higher standard of honour; and so to ameliorate many evils" (H. Spencer, "Morals of Trade," 1874, p. 84).

"The scientific spirit of the present age preaches self-renunciation. The investigations of geology, revealing the existence of the earth for thousands of years before man appeared on it—the discoveries of astronomy, showing how small a fragment the earth is in the vast immensity of the universe—the records of history, teaching the littleness of man in the mighty course of Nature—and the researches of the chemist and physiologist, proving the very close relationship of man to the flower which he tramples upon and the dust which he despises. How persistently has the self-hood of man opposed these revelations of its humbler position in the system of the universe! Willingly or unwillingly, however, man must acknowledge them, nay, must indeed believe it possible that the sun may rise when there is no human eye to behold it, that the birds may sing when there is no human ear to listen, that the fruits may ripen when there is no human hand to pluck them, that the course of Nature may continue though all men have perished" (Dr. H. Maudsley, "Delusions," *Journal of Mental Science*, 1863, p. 23).

In order to do the greatest good to all men we must help them to improve, and this involves entrusting them with knowledge, power, and money. Helping undisciplined persons, however, is often risky; thus, if on the one hand a community remains ignorant, it either remains poor, stagnant, and half dead, or it becomes discontented and revolutionary; on the other hand, if ignorant persons are too liberally entrusted with knowledge, power, or money, they abuse it for a time because they know no better; in either case there is risk, and a choice has to be made between the two. In the first of these cases, it is narrow-minded not to encourage knowledge and progress, and it is an abuse of power by any class of persons to keep another class ignorant, powerless, or poor. It is usually a lesser evil to entrust them judiciously with a gradual increase of knowledge, power, and money, and constrain them to use it well, than to keep them in a permanent state of ignorance; because after having once experienced those advantages they gradually learn the proper ways of using them, and a certain amount of improvement and progress is secured, and the very fact of this progress shows a balance of good which should determine the choice. The history of various nations has fully proved that those who are unable to accept secular knowledge, or are indirectly induced, discouraged, or prevented from accepting it, are by the operation of natural powers, first punished with poverty and weakness, and if that warning is disregarded they are gradually exterminated by the advance of other nations. The degree of trust which may be wisely placed in un-

trained persons depends upon a variety of circumstances, and differs in every different case; usually the less instructed the persons the less can they be safely entrusted with increased powers, and the more they demand and try by violence to obtain. It is largely in consequence of insufficient secular knowledge being entrusted by some religious sects to their adherents that the latter remain poor and miserable.

According to one writer:—"the interests of the social organism and those of the individuals comprising" (composing?) "it at any particular time are actually antagonistic; they can never be reconciled" (B. Kidd, "Social Evolution," 1895, p. 85); according to science, however, both these conclusions arise from taking a too narrow view of the subject. It is a fundamental scientific conclusion that the entire system of the universe is one of law and order even to its minutest parts, and that no one part is essentially antagonistic to another; as knowledge advances we are better able to perceive this truth, and this is shown by the great increase of altruistic institutions and arrangements during the last fifty years. According to the same author, "science has yet obtained no real grasp of the laws underlying the development which is proceeding in society" (*ibid.*, pp. 22, 23); the fact, however, is, the chief powers and principles which underlie and govern social and religious development are the well-known ones of universal energy, consistency, causation, continuity, evolution, action and reaction, conservation of matter and energy, etc.

Ordinary altruism includes the formation and support of all kinds of philanthropic, charitable, and benevolent institutions and societies, and all combinations of persons for the purpose of mutual benefit and improvement. Cosmopolitan altruism includes the mutual assistance of nations by each other, as in the case of subscription to aid national suffering caused by great terrestrial disasters, desolation by wars, by religious atrocities, etc., etc., it also includes original scientific research for the discovery of knowledge, the support of foreign missions, peace and arbitration societies, etc.

Many persons are compelled by the influence of their environments to do good to others without payment or reward, thus medical men are constrained to give medical advice, ministers of religion to console the afflicted; scientific men to make laborious researches and publish the knowledge obtained; persons in high social position must use their influence for the good of others, those who are wealthy must subscribe to charitable institutions; ratepayers must support lunatics, paupers, and criminals, etc., etc.; everywhere we must to some extent "bear each other's burdens." If by the making of a railway the springs of a locality are diverted from the use of the inhabitants, the latter have usually very little legal redress, they must suffer for the benefit of the travelling public. But whilst individuals are sacrificed to the general community in some cases, in others the community is sacrificed to individuals; thus shareholders in a company are not unfrequently sacrificed to the promoters and vendors.

Altruism is not confined to man, all creatures that live in societies must practise it, otherwise they could not live together. It has been observed in a great variety of animals, insects, etc. Multitudes of reliable instances are on record of the affections of nearly all kinds of birds, beasts, fishes, etc., who either live in societies, hunt together, work together, help each other in distress, or show affection for each other in one way or another. Duties useful to man are frequently performed by dogs in taking care of sheep, fetching home cattle, guarding premises, etc. It is said that spiders cannot live in societies because they kill and eat each other. According to some scientific authorities altruistic actions are performed by plants towards each other (see p. 154, also J. E. Taylor on "The Sagacity and Morality of Plants," 1891, pp. 179, 180, 183, 185, 186).

The principle of altruism continually operates in our bodily organs, thus "besides the office which each habitually performs, it is capable of having its action occasionally increased, for the purpose of supplying the deficiency of one or more of its fellows. If perspiration by the skin languishes, transudation by the lungs increases; if neither the skin nor the lungs be able to remove the superfluous hydrogen and carbon, these inflammable substances are carried out of the system by the liver in an augmented secretion of bile. If the action of the liver be diminished, that of the kidneys is increased; and if the secretion of urine be suppressed, the secretion of bile is augmented. When the absorbents are oppressed by the quantity of fluid poured into the stomach, or when the system is at the point of saturation, and no absorption can go on, the veins take up the superfluous liquids, pour them into the circulating current, and bear them to the kidneys, by which organs they are rapidly separated from the blood, and carried out of the body. The weakness of one organ is compensated by the strength of another; the diminished activity of one process is equalised by the increased energy of some other to which it is allied in nature and linked by sympathy; and thus the evils which would result from the partial and temporary failure of an important function are obviated by some vicarious labour, until the enfeebled organ has recovered its tone, and the natural balance of the functions is restored" (S. Smith, "Philosophy of Health," 3rd edition, vol. ii, p. 412). When the digestive power of the stomach is weak, more of the digestive action is performed by the intestines. Nothing can exist for itself alone. The principle of altruism or mutual bearing, like that of mutual sharing, exists throughout the whole of animated Nature; and it might easily be shown that the fundamental basis of altruism lies deep in the properties and molecular motions of inanimate substances.

Sympathy for pain and suffering is a mixed altruistic action, partly mental and partly physical, the physical sensations exciting the mind, and the mind by means of imagination reacting and exciting nervous sensations; the so-called "anti-vivisection" movement is largely an instance of this kind. Sympathy for pain should in all cases be proportioned to the degree of sensitiveness of the sufferer; a race-horse is far more sensitive

than a cart-horse; and it is similar with different human beings; a refined lady feels pain and poverty much more acutely than a dock-labourer. The undue sentimentalism which has objected to punishment of children in schools is partly a cause of rowdyism in the streets:—

> "There shall come from out this noise of strife and groaning
> A broader and a juster brotherhood,
> A deep equality of aim, postponing
> All selfish seeking to the general good."
>
> —*Sir L. Morris.*

63. Third Rule—To Take Care of Life, Health, and Character.

This rule is implicitly contained in the first one, because when we fully obey that one we obey all the others. "Self-preservation is the first law of Nature"—"all that a man hath will he give for his life"; the desire to live is usually the strongest of all passions, but not in persons when they commit suicide. It is a moral duty to keep the body and brain healthy, because each man is usually the chief caretaker of himself, and unless he is healthy he cannot fully perform his duty to himself or to others. Self has usually the first claim upon his attention, nevertheless there are cases where he ought to sacrifice his health, and even his life, for the good of others, and many men do so. When a man is taking care of himself, he is usually doing the best for others, because the two actions are correlative; but sometimes the influence of natural powers compels him to abandon others to a painful death, or even to kill them, in order to save his own life. The proper limit of selfishness is a very complex and difficult question, usually dependent upon a number of circumstances, some of them incommensurable ones, differing in every different case, and it may be included in the rule "to do the greatest good"; but in many instances everything and everybody are largely sacrificed by men in order to save their own lives or to obtain an income; whilst self-preservation is a great cause of "immoral" actions, it is also a large cause of moral ones. According to H. Taylor, "The programme of national morality must be self-preservative before any higher motive" ("The Morality of Nations," 1888, p. 57).

Ignorance largely unfits a man for taking proper care either of his life, health, or character, and greatness of intellect is favourable to long life, because it is usually accompanied by a strong sense of duty in all important matters. It often requires considerable knowledge and self-command, much more than most men possess, to be enabled to preserve health and life, especially after middle age. Moderate use of all our physical and mental powers, with alternations of work and rest, pleasure and trial, contribute to long life; "it is better to wear out than rust out." Indolence, excess of food, and strong drink, kill many men; both these habits are common ones, and it is not only taking the wrong kinds, but

excessive quantities of solid food, which most shortens life. "If you are fond of life, don't waste it." "He who shortens his own life hastens his own death," and most men are in some degree unintentional suicides. Excess of athletic exercise, especially in its violent forms, such as foot-balling, cycling, etc., not only strains the body, the heart in particular, but deteriorates the mind by developing coarseness and ruffianism, and this is seen in football contests, where the victors are frequently attacked and the referees mobbed; such exercises are also attended by gambling, and the demoralising influence of gate-money; it is said that "footballing is nearly as brutalising as prize-fighting." Excessive cultivation of violent sports is largely a relic of barbarism; physical strength is of much less value now than it was centuries ago, when men were frequently compelled to fight for a living, and had to perform a very large amount of bodily labour which the steam-engine, machinery, gas, gunpowder, electricity, and various contrivances, now do for them; this nation does not now depend as much as it did upon bodily strength, except in the case of common labourers, heavy workmen, and to some extent soldiers and sailors. Physical strength is no longer "the backbone of English life"; the power of a nation lies far more in knowledge and wisdom, and in a judicious direction of natural energies. Even in war, in which it was once of greater importance than now, the value of mere physical strength when opposed to scientific engines of warfare, to ironclad steamers, enormous and rapidly-firing guns, smokeless gunpowder, shells, torpedoes, etc., is comparatively small, and is rapidly becoming less; a mere handful of men can now, by the aid of the resources of science, sweep out of existence a multitude who trust in physical strength. The defeat of the Dervishes is an illustration of this; they were killed in thousands by the rapid and continuous stream of shot from the guns.

Next in importance to the preservation of physical health is that of the intellect, and this is best attained by storing the mind with great general principles and avoiding all untruths; a man who fills his mind with trifles to the exclusion of fundamental truths cannot be mentally strong; and he who holds fixed unprovable beliefs upon important questions cannot be thoroughly sane. It is as necessary to take care of our character as it is of our health. To lose money is painful, but to lose character is much worse. A good character is the noblest of all possessions; a good life usually ensures a good name, but not in the opinion of ignorant or ignoble persons; public opinion, like individual estimation, is only of value when it is wise. It is similar with a man's character as it is with his body and mind, or with any complex machine, there is nearly always some one point which is weaker than the rest; and if this one part is greatly defective it mars all the others. It is beyond the power of any man to acquire a perfect character, because it would require superhuman powers—viz., unlimited knowledge, and unlimited power to properly apply it. Much might be said on this subject if it was necessary.

64. Fourth Rule, "To Love Your Neighbour as Yourself."

The great moral rule "to love your neighbour as yourself" is largely synonymous with the one that "*we should do unto another as we would have him do unto us under like circumstances*," and has been largely considered under rule 2. It is evidently based directly upon the fundamental fact of causation—viz., that "the same cause always produces the same effect under the same conditions"; for if this fact could not be relied upon as being certain in every case and perfectly free from supernatural influence, "divine interposition," etc., the rule based upon it would be unsafe; a man cannot safely love his neighbour as himself, unless his neighbour and himself are alike in all essential conditions and respects. Herein lies a universal scientific basis of morality and of moral conduct, which must sooner or later be recognised and adopted by theologians and others as the true one. "Do as thou wouldst be done to, is a sentence which all nations under heaven are agreed upon," and "here is the sufficient germ of a complete ethical code" (W. S. Lilly, "On Right and Wrong," 1890, p. 106). The thoroughly conscientious man habitually tries to obey this rule.

It is conspicuous how very little notice has been taken of this manifestly scientific foundation of morality by teachers of religion, and this is probably accounted for by defective education, and by their minds having been led away from the great truth of universal causation by the more attractive idea of a great man-like Deity who personally attends to the whole of the affairs of the universe and especially to those of mankind, and who can be influenced by prayer to gratify the mere wishes of men.

Success in applying this rule depends upon knowledge and wisdom, and upon the circumstance whether what we would do unto another would really be the best for him, and this may be a serious and difficult question; its seriousness is illustrated by the fact that when religious sects tortured and burned each other in such large numbers they ignorantly believed that it was for the good of the victims; but it was no doubt accompanied by a large amount of sectarian hatred, because when men cannot convert each other by argument they naturally hate each other and resort to violent measures.

The Chinese, Buddhist, and Christian rule, to "do unto another as you would have him do unto you," is too narrow to include all possible cases; and is much less comprehensive than the rule, "to do the greatest good." Instead of referring all acts of morality to omnipotent natural energies and immutable laws, which provide for rational reward and punishment in all cases, it refers them only to individual opinion, which varies with each person, and with the same one at different times; it is manifest that an ignorant man would often wish to have done unto himself and to others that which would be essentially wrong; still the rule is useful as a rough

approximation, and is easily understood. There can be no satisfactory code of human morality until all moral rules are based upon immutable laws, with real omnipotent energy instead of an imaginary Deity to enforce them.

On the one hand, whilst obedience of the ordinary religious injunction, to love our neighbour as ourselves, does not exclude sectarian hatred and cruelty, and does not prevent "religious atrocities"; on the other hand, the scientific rule "to do the greatest good to all men," being based upon universal causation, diminishes hatred, increases toleration, forbearance, and charity, because universal causation affirms that all men do as they must under their own particular circumstances. According to Machiavelli, "mankind injure others from motives either of hatred or fear"; and according to Spinoza, "hatred can never be good." Hatred is a malignant emotion, injurious to the hater, and we should hate no man, but rather try to avoid all that is "bad." To "think evil of no man" is an excellent rule of conduct. To avoid all "evil" and all bad men, is, however, impossible, and we have no choice but to try to improve each other by discovering and diffusing truthful and moral ideas.

65. Fifth Rule—To Continually Improve.

When we consider the vast amount of avoidable suffering inflicted upon their fellow-creatures and upon themselves by ignorant and untrained persons, and that this source of human misery is probably greater than that of all others put together, we may conclude that it is a paramount duty of all persons to improve their mind and conduct. There are multitudes of persons, and more women than men, who go through life without giving sufficient thought to self-education, and who rarely read anything better than a novel or a newspaper; many think that they are "eternally saved," whilst they are really fixed more firmly in error; and many will not make the least present sacrifice for the sake of future benefit, however great. One evil result of this by the poorer classes is that they do not fit themselves for the duties or changes of life, nor for any skilled labour, they fail to become good citizens or to raise themselves to a better position; they live "from hand to mouth," and are often on the brink of poverty and starvation; they are always more or less a burden upon those who have laboured hard and made great sacrifices; they fill the asylums with lunatics, the workhouses with paupers, and the gaols with criminals. And a result of such neglect by young men amongst the upper classes is that they often spend their lives in frivolous and inferior pursuits, stimulating their lower faculties whilst neglecting their higher ones, squandering their patrimony, and when they become old their minds are occupied by the painful reflections of having wasted their lives and opportunities, and their bodies are afflicted with painful diseases. Another result in the case of parents,

especially mothers, is that, not having disciplined themselves, they are incompetent to properly discipline their children, and this produces a multitude of undisciplined adults, paupers, and criminals. Further, the examples set by some of the most aristocratic persons are such as to encourage the lower classes to waste their time and energy in sensual occupations and amusements.

According to John Locke: "Our business here is not to know all things, but those which concern our conduct"; this, however, must include a sound foundation of fundamental truths and moral rules. "Every man is morally bound to cultivate his intellect" (H. Porter, "Elements of Moral Science," 1885, p. 345); "men universally enforce upon one another this duty" (*ibid.*, p. 346), and "so far from accepting stolid or wilful ignorance as an excuse they treat it as itself criminal" (*ibid.*). "The community holds a man to his profession" (*ibid.*, p. 348); and those who profess to teach morality may be reasonably expected to know its scientific basis. "The law holds men accountable for culpable ignorance" (*ibid.*). Those who wish to excel must do everything well; the only way to attain excellence in a calling is to devote one's self entirely to it, and to bring every possible aid to it, and complete the labour, otherwise those who employ those means will surpass us. "The Father of our race decrees that culture shall be hard" (Virgil's "Georgics," 1, p. 121). "The road to eminence ought not to be made too easy, nor a thing too much of course" (Burke). The great bulk of mankind are satisfied with mediocrity—*i.e.*, by that which is only moderately good, and which can be done easily and quickly; not the best, but second, or even third-rate. Neglect of self-inspection, self-training, and improvement, conduces to insanity (Dr. Forbes Winslow). "Only a fool repeats his mistakes"; nevertheless many persons, otherwise excellent, continue to do so throughout their lives. Scientific persons are of all men usually the least conservative and the most ready to adopt improvements.

The evil effects of ignorance, and the necessity and advantages of knowledge, have already been generally considered (sections 52, 53). One of the greatest inducements to virtuous conduct is the possibility of self-improvement and the pleasure it affords; but many persons are too indolent to improve. Every untrained person is a menace to the safety of society, and every ignorant nation is a danger to itself and to neighbouring nations. Untrained animals are dangerous; some untrained dogs will worry and kill sheep, and untrained men are incessantly injuring their fellow-men; the destructive propensities of the lower classes are notorious. Men who are weak for good are often strong for evil. The moral rule of continual self-improvement is largely based upon the scientific law of evolution, and the duty of obeying it flows from the larger duty of doing the greatest good, because the more we improve ourselves the more qualified are we to do good. "He who reforms himself reforms others," and is able to truthfully say:—

" I, thus neglecting worldly ends, all dedicated
To closeness, and the bettering of my mind."
—*Shakespeare.*

Men must not be kept ignorant nor poor, nor be discouraged from learning ; every one must be allowed a fair chance of improvement, and if necessary induced by all fair means to improve. Ignorant men and women are like children, and if they are not trusted to a reasonable extent they cannot improve. It is a crime against society to compel persons to remain defective. " Liberty to improve has, however, usually come by conquest and not as a gift ; its extension requires a good judgment, because liberty hath a sharp and double edge, fit only to be handled by just and virtuous men " (Milton, " History of England," Book 3). If life was not a state of progress and improvement, complaint and dissatisfaction would be unnecessary. It is healthful to remember " the nobility of labour, the long pedigree of toil " (Longfellow).

" What is noble ?—'tis the finer
Portion of our mind and heart,
Linked to something still diviner
Than mere language can impart :
Ever prompting—ever seeing
Some improvement yet to plan ;
To uplift our fellow-being,
And, like man to feel for man !

" What is noble ?—is the sabre
Nobler than the humble spade ?
There's a dignity in labour
Truer than e'er pomp arrayed !
He who seeks the mind's improvement
Aids the world in aiding mind !
Every great commanding movement
Serves not one, but all mankind."
—*C. Swaine.*

Even in this comparatively enlightened age, teeming with the moral advantages of knowledge and self-training in all directions, instead of the ignorant and poor being more encouraged in intellectual and moral improvement, they are induced by the least scientific of theologians to place faith in unprovable assertions, to take pilgrimages to the shrines of saints, holy-wells, etc. ; and respecting such processions of the poor in body and mind, one poet has said :—

" Of a truth it almost provokes me to laugh
To see these beggars hobble along,
Lamed and maimed, and fed upon chaff,
Chanting their wonderful piff and paff,
And, to make up for not understanding the song,
Singing it fiercely, and wild, and strong."
—*Longfellow.*

Those who encourage ignorance help to keep mankind in mental slavery; the ignorant are entitled to some share of knowledge, and to a fair trial of the use of it; but how far they are entitled to gratuitous knowledge depends upon all the circumstances of each particular case, and this is often a difficult question to solve. It is frequently dangerous to confer power suddenly upon ignorant persons; America has had to pay dearly for conferring suffrage upon a great number of ignorant emigrants and negroes, before they were qualified to become good citizens (see "Black America," by W. Clowes, 1891).

It is ignorance of the great powers and laws that underlie human government which in all ages has made bad government and despotism possible; it made possible that of the rulers of Rome, that of the Spanish Inquisition, etc., it still renders possible the despotism of the king of Dahomey, that of the Roman Catholic and other priesthoods, and of trades union leaders, etc. Ignorance in rulers produces tyranny; wherever men's rulers are tyrannical, their electors are ignorant, for when the latter are intelligent they seek more intelligent and upright representatives. "Every notion, every knowledge, be it right or wrong, influences man's conduct. If the moth knew that fire burns, it would shun the flame. And if a theoretical knowledge of the laws and conditions of life had no influence, let us despair and die; but the truth is, they have a most powerful influence upon us" (*The Open Court*, No. 53, p. 1182). Government by unproved dogmas is largely government by ignorance, and is largely a system of pottering with the defects of mankind.

Whilst it is necessary to keep our bodies in health, it is very important to train our minds, because the brain largely governs the body and decides what is best for it; as we think, so we act. The more complicated the organ, the more it requires to be trained; the brain requires more training than the body, and the intellect and character require the most of all. The highest morality cannot be attained without thorough intelligence, nor can the intellect move without previous desire; we must in many cases know what is right in order to do it. "It is not enough to mean well; knowledge is the key to the morals of society, as well as to its other problems" (Buckle). The gradual dissipation of ignorance, combined with obedience to scientific laws and rules of morality, is the true and only means of salvation of mankind. If men do not read they will not sufficiently inquire; and if they do not inquire, they will not improve. Those who make excuses, often do not sufficiently want to improve; and persons who will not take the trouble to improve do not deserve to succeed in life or to be happy. To cease to improve is to begin to die. Although we cannot by mere volition directly improve, we indirectly enable our environments to improve us by avoiding temptations and seeking good influences.

Even the method of education and training has to be carefully considered beforehand. The great defect of present education is, that it does not sufficiently include the teaching of morality. "High education is a

leveller, and unfavourable to genius and reflection" (Sir B. Brodie). According to Dr. Newman, self-educated persons are "likely to have more thought, more mind, more philosophy, than those earnest but ill-used persons, who are forced to load their minds with a score of subjects against an examination, who have too much on their hands to indulge themselves in thinking or investigation; who devour premise and conclusion together with indiscriminate greediness; who hold science on faith, and commit demonstrations to memory, and who too often, as might be expected, when their period of education is passed, throw up all that they have learned in disgust, having gained nothing by their anxious labours, except, perhaps, the habit of application." "Yet such is the bitter specimen of the fruit of that ambitious system, which has of late years been making way among us. But its result on ordinary minds, and on the common run of students, is less satisfactory still. They leave their place of education simply dissipated and relaxed by the multiplicity of subjects, which they have never really mastered, and so shallow as not even to know their own shallowness" (Dr. Newman's "Lectures"). The sons of wealthy persons often receive the least solid education. "Many are apt to think that to dance, speak French, and to know how to behave among great persons, comprehend the whole duty of a gentleman, which opinion is enough to destroy all the seeds of knowledge, honour, wisdom, and virtue among us" (Dean Swift). Simply on account of the wealth of their parents some young men are allowed to occupy a large portion of their time in frivolous pursuits, and some go to seats of learning largely for the purpose of making aristocratic acquaintances.

"He who delays the hour of living well,
Stands like the rustic on a river's brink,
To see the stream run out, but on it flows;
And still shall flow with current never-ceasing."
—*Horace*, Book i, Epistle 2.

66. Sixth Rule—To Prefer Truth to Error.

Universal truth is the foundation of all goodness.

"The struggle between right and wrong
Is raging terrible and strong."
—*Longfellow.*

To prefer truth to error is a very valuable rule, and the important moral qualities of reliability, punctuality, faithfulness to promise, and accuracy of conduct depend upon it.

"This above all.—To thine own self be true,
And it must follow, as the night the day,
Thou canst not then be false to any man."
—*Shakespeare.*

As universal truth represents universal law, truth is an essential element of all moral conduct, and those who neglect great truths are irreligious. No man can possibly be essentially religious who fixedly believes important fundamental statements without proper and sufficient evidence to support them.

"We must never throw away a bushel of truth because it happens to contain a few grains of chaff; on the contrary, we may sometimes profitably receive a bushel of chaff for the few grains of truth it may contain" (Dean Stanley); this may be illustrated by the fact that a cartload of African diamond-earth usually contains only about four grains' weight of diamond, and even the ores of copper do not, on an average, contain more than about seven per cent. of that metal.

The duty of seeking truth is implicitly contained in the precept, "prove all things, and hold fast to that which is good" (Thessalonians, chapter v). Unproved ideas may be either true or false, and only become divine when they are proved by proper and sufficient evidence. To discover great truths is extremely difficult, and "men have forgotten how much blood it costs" (Dante). Love of truth includes the worship of all that is good; "the undevout astronomer is mad." Lord Bacon said that "the inquiry of truth, which is the love-making or wooing of it; the knowledge of truth, which is the presence of truth; and the belief of truth, which is the enjoyment of it, is the sovereign good of human nature." Truth is the essence of all real morality and religion; true religion consists not so much in blind worship of an imaginary materialistic deity, as in humbly learning and obeying the great powers and laws which govern the universe and mankind. The ordinary Christian ideas and worship of a Personal Deity, a bleeding Saviour, "the sacred heart," etc., are highly materialistic, whilst those of eternal and immutable truth are not so. Truth is the real saviour of mankind; and a real hope of salvation lies in knowledge of the great powers and laws which govern us, with constant practice of the rules of morality founded upon it. "Man must have something higher than himself to think of" (Longfellow), and that he can always find in the great truths of science. Unscientific persons prefer materialistic objects of worship; quite a large number of such objects are worshipped by different tribes and sects, and include images of wood, stone, and metal, bulls, serpents, beetles, fire, the sun, a crucified Saviour, etc., and an imaginary idea of an omnipotent personal being who has existed throughout all time, and is infinite and pervades all space (see "Curiosities of Superstition," 1882, by W. Davenport Adams, and other books). "Man cannot make a flea, and yet he will make gods by dozens" (Montaigne).

According to scientific views, many theological dogmas are extremely irrational (see "Modern Christianity a Civilised Heathenism," 1873), and must gradually decay. It is largely acknowledged that Christianity has largely fallen to pieces with regard to the six days creation, the fall of man, the resurrection of the body, the ascension into heaven, the second advent, the fixedness of the earth, and various other doctrines (Crozier,

"Civilisation and Progress," 1892, p. 239, and other writers), and a more scientific basis of religious worship is very desirable for intelligent persons. Christian ministers and teachers of religion are also beginning to find that, unless they conform their doctrines to the great truths of science, their occupation will diminish; and one writer has inquired, "Is it not time to ask whether it is desirable that the clergy should be paid to teach what is not known to be true?" (F. K. Kingston, "Unity of Creation," p. 106). As "Science, by its effects on religious dogmas, has indirectly gone a long way in destroying those religious persecutions, international hatreds, and religious wars, which the modern world regards with almost as much horror as the pestilence itself" (Crozier, "Civilisation and Progress," 1892, p. 116), so will it gradually supply a rational theology and religion.

Carlyle stated that the choice of our ideals is the most important step in life (*ibid.*, p. 27); the highest ideal capable of human attainment, and the noblest object of worship is truth; not only because it agrees with all known phenomena of Nature, but also because it is productive of the greatest good to mankind; and, as it is perfectly rational in itself, it is capable of satisfying all rational desire and imagination; but that it will at once satisfy the selfish desires and utopian imaginations of unscientific persons cannot be reasonably expected.

The relation of truth to theology and religion is very important, because it is the source of all that is essential and good in them. "The question, 'What is true?' ought to stand on the threshold of every religious inquiry" (Archbishop Whately, "Detached Thoughts and Apothegms," 1856, p. 1). "An appeal to truth, as resting upon evidence, is the characteristic of a true religion, and he who propagates a delusion, and he who connives at it when already existing, both alike tamper with truth" (*ibid.*, pp. 8, 129); but frequently teachers of religion sacrifice truth to suit the false ideas of the worshippers. Every different religious sect tries to justify its own existence by asserting that its doctrines are the only true ones; but "there are now about 300 registered religious bodies in England" (M. Dorman, "Ignorance," 1898, p. 321), and many more in other countries, professing most irrational beliefs; and it is well-known that many of their doctrines contradict each other, and are inconsistent with the first principles of science; and that in various religions the professions and practices have largely deteriorated from those of the original founders. The worship of false and unprovable ideas is a relic of heathenism. "He who begins by loving Christianity better than truth will proceed by loving his own sect or Church better than Christianity, and end in loving himself better than all" (Coleridge, "Moral Aphorisms," p. xxv). Up to the present time, "as to the effects of religion on life and action, little has been done in the way of putting the subject on a scientific basis" (Crozier, "Civilisation and Progress," 1892, p. 217); and the direct teaching of morality has been very defective.

What, in a scientific aspect, are theological dogmas? Some of them are occult speculations of human invention, which have never been proved,

and are flatly contradicted by well-verified facts and principles of science. They are to some extent like scientific hypotheses, viz., questions to be solved, or ideas to be tested and corrected by the progress of knowledge; whilst, however, real scientific men only entertain their hypotheses tentatively until they can be tested, sectarians hold their dogmas fixedly and firmly, as if they were absolute certainties; and boldly affirm that they are "revelations from Heaven," "divine truths," "guaranteed by a more than human authority"—"above experience"—"a definite message from God to man" (Cardinal Newman); "the knowledge which is of faith can be the most absolute and certain form of knowledge" (R. C. Moberly, D.D.); 'the believer in God knows that the truth which he holds is as certain as the axioms of mathematics" (Bishop Temple), etc., (see pp. 443, 446, 448, 482, 489). Whilst also theological hypotheses in every one of the many hundreds of religious sects decay as knowledge increases, the hypotheses of science which have been verified by research become stronger as time passes on. Christian theology, like all other theologies, was evolved out of a still more crude and unscientific collection of beliefs. "The Sermon on the Mount is but an admirable resumé of previously known maxims" (S. Laing, "A Modern Zoroastrian," 1888, p. 187); similarly, the terms redemption, grace, faith, salvation, Son of man, Son of God, the Kingdom of Heaven, were household words of contemporary Judaism (*ibid.*, p. 188). Ordinary theology is partly a narrow view of man's duties towards an imaginary being, adapted to the ideas of unscientific persons; whilst scientific theology is a comprehensive and permanent view of universal truth, good for all time and circumstances to intelligent persons.

Science furnishes the means of determining what is real religion, because it enables us to determine what is true; real religion may be termed the highest scientific morality, the worship of truth, the full fruition of which is universal goodness. Whilst the subject of morality is usually considered to consist only of the relations of conduct between man and man, real religion includes man's entire conduct towards all existing things. According to F. Harrison: "The sum and substance of religion is to answer the question, what is my duty in the world, my duty to my fellow-creatures, my duty to the world and all that is in it and of it? Duty, moral purpose, improvement, is the last and deepest word of religion. Religion is summed up in Duty" (Crozier, "Civilisation and Progress," 1892, pp. 202, 203); but according to W. H. Mallock: "Science taken by itself can supply man with no basis for religion" ("Who's Who?" 1898, p. 554). For numerous definitions of religion, consult Max Müller, "Natural Religion," 1892. "Truth and goodness differ but as seal and print; for truth prints goodness" (Dr. J. A. Symonds, "Miscellanies," 1871, p. 114). In science there is such a great variety and immense amount of well-verified and valuable truth to be believed, enjoyed, and worshipped, that no intelligent person need experience any unhealthy desire to fixedly believe that which is uncertain, unprovable, or untrue; and we may rest assured that any such desire is not true religion, nor permanently enduring, even

though it may have existed for ages. The antiquity of error, instead of proving its authority, only proves that mankind have not yet acquired sufficient knowledge and ability to detect its real nature and how to avoid it.

In order to view truth in relation to theology and religion we must first separate it from error; "instead of atheism, then, we find the result of cancelling supernaturalism and submitting to science, is a theology in which all men, whether they consider it or not, actually do agree" (Seeley, "Natural Religion," 1882, p. 47). In the religion of law all men must believe, but in that of theologies all men must disagree (Proctor, "Nature Studies"). As the most rational object of worship is truth, the most genuine mode of practising it, is by discovering, learning, promoting, diffusing, and applying it to good and necessary purposes; and this is what all genuine scientific men are constantly doing, and we see the good fruits of their labours all over the earth. The only real holiness is constant good work and good thoughts. "I seek after truth, by which no man was ever yet injured" (Marcus Aurelius Antoninus). Holiness and godliness are largely proportional to truthfulness; an untruthful man, or one who fixedly believes in unprovable assertions, cannot be very religious. As ignorance of ordinary law is not a sufficient defence in a court of justice, so also ignorance of great scientific truths largely disqualifies a man for assuming authority in the subjects of theology and religion.

Cardinal Newman speaking of science said, "deductions have no power of persuasion" ("A Grammar of Assent," 1870, p. 89); and this is often true with unscientific persons, but even they are in some degree persuaded that there must be some truth and goodness in science when they see eclipses occur at exactly the predicted minute, and the enormous mass of practical results from science beneficial to mankind which exist in all directions. He also remarked that "the religion of so-called civilisation . . . . has no sympathy with the hopes and fears of the awakened soul" (*ibid.*, p. 391); but he did not appear to perceive that the scientific religion of doing the greatest good to all mankind by the discovery and diffusion of new knowledge, or "the religion of so-called civilisation," is not only the most genuine worship of truth, but that it is far more comprehensive sympathy with "the hopes and fears" of mankind than any unintelligent belief in unprovable doctrines can possibly be. He further added: "Many a man will live and die upon a dogma; no man will be a martyr for a conclusion." "No man will die for his own calculations: he dies for realities" (*ibid.*, p. 90); more truthfully stated we may say that men will die for very firmly fixed ideas, whether they are true or false, whether they are conclusions, calculations, or realities; although theological dogmas are not realities, multitudes of "heretics" have died for them simply because they could not eradicate the fixed ideas of them; both Bruno, Galileo, and many other scientific men also suffered greatly in defence of their truthful scientific conclusions for a similar reason.

Some of the present theological beliefs are not real religion, because

they are inconsistent with scientific truths; they are not real mental liberty, but a mixture of irrational license and mental slavery, *i.e.*, a license to firmly and fixedly believed contradictions and unprovable assertions, whilst in a state of mental slavery to unscientific teachers, and to a so-called "infallible church." Whoever adopts a really scientific form of religion, will either have to abandon all such unprovable dogmas, or else hold them under complete mental control, like genuine scientific men hold their hypotheses, *i.e.*, merely as temporary questions to be scientifically examined and answered. How far, and under what conditions it is morally justifiable to assume "infallibility in faith and morals"; to tell untruths in order "to save souls"; to assert that the souls of all men live after they are dead; that there exist such places as heaven, hell, and purgatory; that during the act of "consecration" by a priest, ordinary bread and wine are really changed into the body and blood of Christ; that an infinite mind can exist without a brain; and many others, are questions which are largely capable of being examined by means of science. Such unprovable dogmas "vast and wan" poison the human soul.

The scientific method is not to believe all things which fallible men assert, but to question and examine everything as far as we can; there cannot be much practical love of truth in those who venture to teach, nor in those who slavishly accept, important unproved assertions as settled facts; nevertheless, many are compelled by their environments to do so. "To follow foolish precedents and wink, with both your eyes, is easier than to think"; and still easier and cheaper than to scientifically investigate. It is more worthy of admiration to be an uncouth peasant earnestly pursuing truth at great personal sacrifice, than to be a courteous person propagating unprovable dogmas, because the former is in the van of human progress valiantly overcoming its obstacles, whilst the latter is in the easy stream of popular expediency, often retarding the advance of new knowledge and civilisation; nevertheless there is some degree of justification even for retarding the progress of mankind.

"Who are the great?
Those who have boldly ventured to explore
Unsounded seas, and lands unknown before—
Soared on the wings of science wide and far,
Measured the sun, and weighed each distant star,
Pierced the dark depths of ocean and of earth,
And brought uncounted wonders into birth—
Repelled the pestilence, restrained the storm,
And given new beauty to the human form—
Wakened the voice of reason, and unfurled
The page of truthful knowledge to the world;
They who have toiled and studied for mankind—
Aroused the slumbering virtues of the mind—
Taught us a thousand blessings to create
These are the nobly great."

—*Prince.*

The late Dr. T. Chalmers, in his "Essay on the Modesty of True Science," said of Newton :—"He wanted no other recommendation of any one article of science than the recommendation of evidence, and, with this recommendation, he opened to it the chamber of his mind, though authority scowled upon it, and taste was disgusted by it, and fashion was ashamed of it, and all the beauteous speculation of former days was cruelly broken up by this announcement of the better philosophy, and scattered like the fragments of an ærial vision, over which the past generations of the world had been slumbering their profound and pleasing reverie. But on the other hand, should the article of science want a recommendation of evidence, he shut against it all the avenues of his understanding, and though all antiquity lent their suffrages to it, and all eloquence had thrown around it the most attractive brilliancy, and all habit had incorporated it with every system of every seminary in Europe, and all fancy had arrayed it in the graces of the most tempting solicitations, yet was the steady and inflexible mind of Newton proof against this whole weight of authority and allurement, and casting his cold and unwelcome look at the specious plausibility, he rebuked it from his presence."

> "When I was yet a child, no childish play
> To me was pleasing; all my mind was set
> Serious to learn and know, and then to do
> What might be public good; myself I thought
> Born to that end, born to promote all truth,
> All righteous things."
>
> —*Milton.*

As Newton was a religious man, and a great lover of scientific truth, and the truth of theological beliefs is capable of being scientifically examined and tested, the question may be asked, why did he not carry his love of truth into the subject of theology? the probable explanation is, that science had not then sufficiently advanced, and that he did not know that religion could be so tested; nearly his entire time being devoted to mathematics and physics he had not leisure to properly investigate another very large and complex subject; human life is too short and the human faculties are much too limited to enable any one man to investigate all great questions; and the intellects of very few men are so varied and comprehensive as to enable them to adequately value several large departments of knowledge. A similar question might be asked respecting Faraday, and a similar explanation given; when he was asked by a friend how he could possibly believe the religious doctrines of Sandeman, which were so inconsistent with science, he made the pitiable admission, "I prostrate my intellect"; *i.e.*, he foreswore his allegiance to truth when he entered the dark cavern of unprovable beliefs. Some other scientific men have been in a similar position; and many others, being peaceable persons, have a strong distaste for discussing theological questions, because of the animosity and hatred which it excites; multitudes of intelligent persons

also, including many who regularly attend places of worship, know that if they made public their truthful conclusions, they would be spoken of as infidels, atheists, etc., and there still exists plenty of ignorant fanaticism even in the most civilised communities to make a thoroughly truthful investigation of orthodox theology a dangerous undertaking. Both those who propound truth and those who oppose it, must, however, accept the consequences, and within the limits of their strength be prepared to defend themselves and "give a reason for the faith that is in them." It was largely through fear of exciting a great "religious war" between Christians and Mahommedans that the European powers did not venture to stop the Armenian and Turkish atrocities; and such dreadful occurrences will continue to happen as long as large sections of mankind continue to believe contradictory and unprovable fundamental doctrines. In course of time, however, the fundamental ideas of mankind generally will become more harmonious, like the chief ones are now with men of science.

The morality of science, the future extension of truth, and its influence upon the salvation of mankind, constitute a boundless subject for future ministers of religion to study. The real source of all that is good in scientific truth arises from its verifiable character, its high degree of certainty, and its capacity of standing all the tests which can be applied to it. "Truth is the highest thing a man may keep" (Chaucer). "Every truth that has ever shone out of the heavens or sprung out of the earth, every truth that has ever come through the brain or heart of man in any age, in any part of the world, under any name, is a revelation of infinite divine life" (M. J. Savage, "Social Problems," 1893, p. 21). Real truth is the beau-ideal and highest object of worship of scientific men, and represents the purest goodness. "It is a pleasure to stand upon the shore and see the ships tost upon the sea; a pleasure to stand in the window of a castle and to see a battle and the adventures thereof below; but no pleasure is comparable to standing on the vantage ground of truth (a hill not to be commanded, and where the air is always calm and serene), and to see the errors and wanderings, and mists and tempests in the vale below; so always that this prospect be with pity and not with swelling or pride" (Lord Bacon). This statement truly represents the relative positions of philosophical science and dogmatic theology :—

> "'Tis pleasant through the loopholes of retreat
> To peep at such a world; to see the stir
> Of the great Babel, and not feel the crowd;
> To hear the roar she sends through all her gates
> At a safe distance."
>
> —*Cowper.*

Truth should be our "path, motive, guide, origin, and end" (S. Johnson); those who do not value truth are often not very particular about its kindred virtue, honesty. In a dispute, an intelligent man contends most for truth and less for victory, whilst an ignorant devout one

fights more for success and dogma and less for truth: "Devotion is careless about intellectual consistency" (Cardinal Newman, "A Grammar of Assent," 1870, p. 142); *i.e.*, careless of truth! It is largely correct to say that "the human mind is made for truth, and so rests in truth, as it cannot rest in falsehood" (*ibid.*, p. 214); nevertheless it often "is careless about intellectual consistency," and does rest in falsehood, especially if the falsehood is agreeable; we know that it rested during hundreds of years in the false idea that the earth was fixed and in the centre of the universe; and it is similarly resting now in various false theological notions; usually in religious questions men believe what they prefer.

"Great is truth, and mighty above all things" (Esdras, chapter iv). "The truth shall make you free" (St. John, chapter viii). Truth is powerful in direct proportion to its potential contents and exactitude, and effectual or not according to its suitability to its epoch and circumstances. Whilst it is affirmed that "truth is mighty, and always prevails," it is also stated that "opinion is stronger than truth" (Sophocles. I. Disraeli, "Miscellanies of Literature," 1840, p. 480); that is not truth which governs (*ibid.*, p. 401), but that "expediency unites men." Each of these statements is true, but neither is complete; "opinion is stronger than truth" with imperfect men, for the time being, in an imperfect age, because it conforms to the imperfect state of civilisation; but "truth is mighty and always prevails," because it invariably conquers in the end, when mankind have become sufficiently intelligent to understand it; it is mighty in consequence of the irresistible and never-ceasing cosmic energy which enforces it in a multitude of ways, often indirectly and invisibly. The influence of truth upon men depends largely upon the mental condition of those to whom it is offered; "it is useless to cast pearls before swine," or offer truth to unprepared minds, they require it adulterated. Ignorant men accept error, and for a time rule by their greater number; but intelligent ones ultimately rule by greater knowledge. A mass of opinions is not a pure collection of truths, and "nothing is more abhorrent to a reasonable man than an appeal to a majority, for it consists of a few strong men who lead, of knaves who temporise, of the feeble who are hangers-on, and of the multitude who follow without the slightest idea of what they want" (Göethe). "If there be any amongst those common objects I do contemn and laugh at, it is that great enemy of reason, virtue, and religion —the multitude, that numerous piece of monstrosity, which, taken asunder, seem men and the reasonable creatures of God, but, confused together, make one great beast, and a monstrosity more prodigious than Hydra" (Sir T. Browne, "Religio Medici," quoted by Maudsley, "Natural Causes and Supernatural Seemings," 1897, p. 116).

We consider a thought or a statement to be false when by comparing it with what we know to be true we find that the two contradict each other; in accordance with this we usually conclude that a man is inconsistent when he professes one thing and practises another, and when he practises two inharmonious occupations—thus a man cannot consistently

be a bishop and a horse-jockey, although each is separately consistent with ordinary life; similarly he cannot very consistently be a scientific discoverer and a public promoter of commercial enterprises, because in the latter capacity he has to be an advocate and to sacrifice exactitude to personal gain. No man, however, can attain his highest ideals, and every man is allowed considerable latitude of conduct, and may, to a certain extent, act inconsistently, and even untruthfully, subject to the condition that he must accept the consequences.

The rule, to "prefer truth to error," agrees with the view that our cerebral impressions are produced by and usually constitute a picture of realities; and that those impressions alone are true which are correct representatives of that which exists, or has existed or occurred; and those who prefer unprovable hypotheses to truth and evidence may be compared to dreamers, whose one set of cerebral impressions are inconsistent with others. The act of accepting or rejecting truth or error is a question of duty and evidence; if there exists proper and sufficient evidence for an idea or statement, we ought as a matter of duty to believe it, and if there is not we ought not to believe it; and in all cases the strength and degree of fixity of our belief should be directly proportioned to the strength of the evidence, or to the balance of proof in cases of conflicting evidence. To prefer truth to error is a moral duty, and "the lover of truth, for its own sake, must set himself to *act* as if he cared nothing for either censure or approval" (Archbishop Whately, "Detached Thoughts and Apothegms," 1856, p. 100); but "there will always be men who will prefer a philosophy founded on brilliant sophisms and fluent dialectic to the toils of a true scientific method" (J. Hunt):—

> "He is the free man whom the truth makes free,
> And all are slaves besides."
>
> —*Cowper.*

Although it is certain that a number of theological dogmas are inconsistent with well-verified truths, they are necessary consequences of the same general influences of Nature acting upon the human brain as ideas which are true, and are necessary in an imperfect state of society to induce imperfect human beings to improve. But notwithstanding these scientific justifications of them, they are regarded as "evils" by many truth-loving persons simply because they are false, and because they give rise to so much untruthfulness, dissension, and cruelty; and as falsehood and truth can never agree, they will continue to be regarded as "immoral" until they disappear by the progress of knowledge. Without a sufficient degree of truthfulness social life would be impossible, but some persons, by disliking untruth too much, are induced to tolerate it too little.

Sir Humphrey Davy said, "the human mind is governed, not by what it knows, but by what it believes; not by what it is capable of attaining, but by what it desires" (*Nature*, 1898, vol. lvii, p. 548); thus, even now, at a period of nearly 2,000 years after the death of their founder,

members of Christian sects seriously affirm :—"I know that my Redeemer liveth, and that my spirit will see God," whilst it is simply impossible for either assertion to be true; and they repeat it until it becomes a fixed mental impression which they are quite unable to eradicate, and in this way permanent irrational ideas and a habit of untruthfulness are produced. That belief in false ideas leads to untruthfulness needs but little illustration; I may, however, cite a case, mentioned I think by Miss F. P. Cobbe —viz., that a little girl, Miss Perkins, who had told a falsehood, was ordered by her mother to retire to her bedroom, and pray to God to forgive her; she did so, and returned and said that God had answered her prayer and said, "Pray, don't mention it, Miss Perkins." In nearly every aspect untruthfulness is irreligious.

Veracity is one of the most valuable of moral qualities; the statement "I can always trust what he says," is one of the greatest personal recommendations. "To tamper with veracity is to tamper with the vital force of human progress" (John Morley). "He who hides truth is as bad as another who spreads falsehood." Habitual exaggeration often leads to habitual lying; "it never rains but it pours"; and it is frequently worse than downright falsehood, because its falsity is often much more difficult to detect and expose. Strong language is frequently untruthful, and is usually less effectual than gentle words, because it is apt to raise separate questions which obscure the original one; any man who employs it, or uses habitual exaggeration, is very liable to find himself unable to give up the habit, or to retract his statement when he discovers that he is in the wrong. Hysterical persons are often great liars and deceivers, and success in oratory and in getting money is often accompanied by untruthfulness. Falsehood is very prevalent, a thief caught in a wrong act usually gives a wrong name and address, and cyclists do so frequently.

Half-truths and one-sided statements by suppressing truth are often worse than palpable lies, because they are more deceptive. "An excuse is worse than a lie, for it is a lie guarded" (Pope). And with regard to wilful untruths, one writer says, "Better were it for the sun and moon to drop from heaven, for the earth to fall, and for all the many millions who are upon it to die of starvation in extremest agony, so far as temporal affliction goes, than that one soul should tell one wilful untruth, though it harmed no one, or steal one poor farthing without excuse" (Cardinal Newman, quoted by W. S. Lilly, "On Right and Wrong," 1890, p. 56); nevertheless, the writer of this extreme statement was so far unable to attain his own high ideal of the importance of truthfulness as to make the unprovable and seriously important assertion that "the Church is the infallible oracle of truth," and several other kindred ones ("A Grammar of Assent," 1870, p. 148); he does not tell us the valuable secret how he measured the degrees of "evil" in the above cases. The very greatest of fallacies and untruths continue to be extensively propagated and believed long after they have been detected and exposed, largely in consequence of the impetus of the mass of habit, and because mankind are unable to examine them.

Aristotle mentioned two kinds of liars—viz., "the liar who loves a lie for its own sake," and "the liar who lies to win reputation or to make money" (W. S. Lilly, "On Right and Wrong," 1890, p. 172); and he might have added, he who tells falsehoods "for the good of the Church"; or through deficiency of fundamental knowledge.

Falsehoods are either wilful or unintentional, and the latter are probably far more numerous than the former because of the greatness of our ignorance; the whole of mankind, even the most learned as well as the most ignorant, must necessarily, each individual, tell a great many untruths without knowing it. The evil effects of an untruth are usually much the same whether it is wilful or not; and the degree of culpability of uttering either a wilful or an unwitting untruth is usually guessed by the relative magnitudes of its total evil and good effects. He who tells an untruth is often obliged to support it by another, and so on until quite a fabric of falsehood is formed; it was largely in this way that erroneous systems of theology were produced.

It is important to tell no untruth at any time, and be careful to tell the truth at proper times and seasons; to speak the truth at improper times or under improper circumstances is in some cases both unsocial and illegal; advanced reformers have to be careful in this respect lest they may be guilty of libel. Some persons are often afraid to speak the truth when it is their duty to do so; for instance, the Irish Land Leaguers were afraid to incriminate each other after committing murders. As a man's ideas largely affect his conduct towards his fellow-men, he has only a limited moral right to hold untruthful beliefs; and in serious cases where the welfare of other persons is injured, each man is morally bound to render sufficient and proper evidence for "the faith that is in him"; thus the defenders of "faith-healing" have been in some cases convicted of manslaughter and legally punished. The law compels men to give evidence, and punishes contumacious witnesses; in courts of law the whole truth usually comes out because both sides of a subject are usually presented by the two opposing groups of counsel and witnesses.

According to various writers, and to recognised customs amongst honourable and intelligent persons, there are extreme cases of necessity in which it is not considered immoral to tell an untruth, such as in the saving of human life or in some cases of property. Plato said, "the lie in words" may be used in two cases—(1) to deceive men for their own good, as with sick persons and lunatics; (2) when it is not possible to speak the exact truth (Plato's "Republic," quoted by Marcus Dorman, "Ignorance," 1898, p. 61). If intentional untruth is in any cases morally justifiable, it must be upon some rational basis, something more sound than an unproved hypothesis; it may be justifiable in some cases only when it is the least of two serious unavoidable evils. As we may justly withhold property from a person who has no real claim to it, so also may we withhold knowledge in a similar case, but we may not readily tell an untruth in defence

of our property or knowledge. According to scientific views, the most unblushing falsehoods are not unfrequently told for "pious purposes" (see Lecky's "Rise of Rationalism in Europe," 1890, vol. i, pp. 396-400); and some of these untruths are usually excused on the plea of their being metaphors, whilst it is well-known that they are often received as "divine truths" by ignorant hearers; and in this way falsehood is spread in all directions. As it is a duty for our bodily safety to keep out of physical danger, so also is it to avoid listening to unprovable statements and figurative language in serious subjects. To exaggerate, or to give untrue names to things is allied to deceit, nevertheless it is openly and very extensively practised by tradesmen and others in advertisements, etc., in order to sell their wares and services. Departure from plainness of speech in serious or profound subjects, whether secular or religious, also tends to raise animosity, destroy friendship, and excite conflict; and the assertion of theological hypotheses, as if they were real truths, tends to set sect against sect, husbands against wives, children against parents, and to divide and estrange the nearest of friends. False or dishonest representations in any subject may be scientifically regarded as signs of mental disease. "Old men and travellers tell lies by authority," and many others do the same in subjects which the public do not understand.

The justification of exaggeration, deceit, and lying, on the ground of necessity, is a very difficult matter on account of the complexity and abstrusity of each particular case, and but few writers have ventured to lay down rules in it; in nearly every instance, however, it resolves itself into a choice between two "evils"; each case has to be decided according to all the attendant circumstances, and the final conclusion is usually only a guess. The entire subject is a good illustration of the feebleness of the human intellect when it has to assess the relative amounts of good or evil of two complex incommensurables. It is usually considered that whilst a man may not tell an untruth in order to avoid a small loss to himself, he may to prevent a great public injury. "The consciousness of cowardice and meanness which attends a lie spoken in a man's own interest hardly attaches to a lie spoken for the purpose of protecting another" (Professor T. Fowler, D.D., "Progressive Morality," 1895, p. 59). The degree of justifiability of the common untruthful excuse, "not at home," is a difficult question of casuistry.

The question naturally arises here, how far is it justifiable to tell untruths for "pious purposes." As this is a subject more suitable for theologians than for men of science, I need say but little about it; I may, however, remark that the practice is usually attempted to be justified by the excuse that it is done for the purpose of "saving souls" from hell, and is based upon the assumption that "the value of a human soul is infinite," as, however, neither the existence of hell, nor that of the soul after death, nor the "infinite value" of a soul has ever been proved or measured, such an excuse and assumption does not really justify it; and

its chief justification probably lies in the necessity of human ignorance and the influence of environments.

As all men are imperfect in different degrees, and the acquisition of truth is a very slow process, it is usually inexpedient to expose human defects; and "those who live in glass houses should not throw stones;" nevertheless, "circumstances alter cases"; it is necessary in a book on the scientific basis of morality to illustrate the dependence upon the scientific principle of causation of the great moral rule, "To prefer truth to error." Instead of going with the truth, the great mass of mankind are compelled by internal and external circumstances to "go with the tide," *i.e.*, to improve at the average rate of progress of civilisation. Ordinary traders and manufacturers hardly dare in business to be much in advance of the practices of their rivals, however untruthful those practices may be; a perfectly truthful or honest man could hardly gain a living in a community of deceivers. A trader finds it difficult to be perfectly truthful, because many of his fellow-tradesmen and customers will not permit him, he must puff his wares by untruthful advertisements in order to sell his goods and prevent himself becoming bankrupt; for instance, if his rival puffs a particular mixture of old teas as "a new tea," he must make a similar assertion. "If you want to hear some lies, listen to those who advertise"; each one says his article "is the best"; but it is impossible for all to be "the best." We all know that a profession of religion is a tacit assumption of superior morality; nevertheless, the individual members of a sect are practically compelled by their fellow-members to accept its creed whether it is true or false; further, if a member of a sect is an immoral person and happens to be rich or influential, and is willing to support the belief or sect, his defects are to a certain extent overlooked by his fellow-members in consequence of their need of his money. A man, to be popular, must hold popular beliefs, and adopt popular customs, whether truthful or not; the very fact of a man being popular in profound and complex subjects, such as religion, implies untruthfulness of some of his ideas, because his views largely agree with those of an imperfectly civilised community; a popular man in such subjects is the mental slave of his fellow-man; his mind is largely governed by those of his supporters. It was at one period a favourite cry, "The voice of the people is the voice of God," but this was a very false and conceited cry; and if it had been true, the "God" must have been a very ignorant one. Ask any person who has behaved untruthfully why he did so, the reply in nearly all cases practically is, that he was compelled to, and that is usually the true explanation.

It is folly to expect mankind in general to rapidly adopt advanced scientific beliefs; they often have not the power. We must accept the world as it is, and mankind as they are with all their imperfections, and not as they will be a hundred years hence. We must treat men and things as they are, rather than as we wish them to be, or as we think they should be; we have very little power to hurry on a millennium. There is often a

limit to which the truth should be spoken, and more harm than good may be done by too freely exposing defects which lie deep in the nature of men and things, and which cannot for hundreds of years to come be avoided or cured; and as the second rule of morality is to do the greatest good we may not speak at all times in season and out of season the whole of the truth, even if we know it. Important truths are often known by intelligent men long before mankind in general are able to accept or adopt them.

A vast amount of untruth is told in the form of promises. Frequently we see accounts in newspapers of widespread calamities due to blind confidence in the statements and promises of others; multitudes of persons are everywhere the victims of a great variety of "promisers," including promoters of companies, speculators, priestly advisers, agitators, platform orators, quack doctors, "bond-system" tea dealers, lottery proprietors, advertisers, tipsters, etc., etc., and the promises made are of the greatest possible variety, from "a pound for a penny" to "everlasting life and happiness" in return for a mere "confession of faith," *i.e.*, practically an infinitely great reward for an infinitely small sacrifice, and multitudes of persons are so credulous as to believe them. One of Dickens's imaginary characters is made to say, "beware of widows," but we might with earnestness and propriety say, "beware of promisers." It is a matter of secondary importance by what class of persons the promises are made, if there exists no real evidence for the beliefs upon which they are based, they are essentially defective. To promise an impossibility is a very dubious act; and to tell persons that they will "live for ever" is a kind of "fortune-telling," because it is not based upon proper and sufficient evidence. In many cases it is largely because men are not entirely their own masters, but are governed by the energies of Nature acting through them, that they fail to fulfil their promises; thus manufacturers are dependent upon their workmen, tradesmen upon their servants, and the workmen and servants again upon others; but the fact remains that the promises are made, and the persons who made them as well as those who accepted them are usually injured by the non-performance. "The blind lead the blind, and they both fall into the ditch." A large inducement to false promising by medical men is ignorance on the part of the patient, and in rare cases deficiency of principle on that of the practitioner; a very large number of persons can only be induced to try and improve their health by pandering to their ignorance by false statements such as only a mendacious quack would descend to offer them. "It is but too common for some practitioners to advise a patient to do what they can discern he wishes to do" (J. Fothergill, M.D., "Maintenance of Health," 1874, p. 272). It is similar with many who wish to be "saved"; they will have promises which agree with their selfish desires. What are the exact boundaries between proper and improper promising is often a very debatable question and depends upon all the circumstances of the particular case; for instance, how far may the promoters of a new company make under false pretences promises of a dividend to the shareholders?

Promisers are in many instances conscientious persons with good intentions but insufficient ability, who have repeated their statements so many times that they firmly believe them; in other cases they are artful ones who recklessly trade upon the ignorance of mankind for their own advantage, and it is frequently difficult to distinguish the one from the other; but in any case, conscientiousness alone is not a complete justification of making a careless false statement. Promisers, whether laymen or clerical, are not infallible; one result of this is, that frequently the promises are not fulfilled, large numbers of persons are deceived and a great amount of misery ultimately produced, for instance, the case of "The Liberator Companies"; in other instances no direct means exist for ascertaining whether the promises are fulfilled or not, because "dead men tell no tales"; in the "tea-bond" system, for example, no disproof of the fulfilment of the promise could be obtained until more than one hundred years had elapsed, meanwhile both promiser and dupe would have died and the fraud would be unredressed, so that in either case the promiser wins and the other loses, similar to the gambling arrangement of "heads you lose, tails I win"; the fallacy might, however, be detected beforehand by means of inference. According to English law, "a promise to pay without a specified time of payment is of no value." The minds of men in general are not sufficiently trained to be able to detect the artfulness, or to perceive the unintended untruthfulness, whichever it may happen to be, of promises of post-mortem rewards. To promise a bribe is usually considered dishonest. The promises of salvation and of eternal happiness detract immensely from the morality of the Christian religion. The practical promise of a millennium by socialist leaders is based upon blind belief to a very large extent, and is proportionately attractive and misleading to uninstructed persons. Mr. Balfour says, "the agitator who does not know how to wrap up a bad policy in fine language does not know the ABC of his business"; and Carlyle said:—"nothing does so much harm as beautiful lies beautifully told." The best justification of a false promise is when it is the least of two evils, but which is the least can hardly be decided by untrained persons. How far was Luther justified, when in a letter to his little son he told him to say his prayers and learn his lessons well, because he had seen a certain garden in which children in golden dresses ran about eating apples, cherries, and nuts, and riding little horses with golden bridles and silver saddles (Sir James Stephens, "Essays on Ecclesiastical Biography," vol. i, p. 301). The late C. H. Spurgeon very truthfully said "error in the pulpit is like fire in a hay loft" ("The Salt-cellars," vol. i, p. 149); but he also in a sermon to open neglectors and nominal followers of religion, March 24, 1867, is reported to have said:—"My dear hearer, whatever thy past life may have been, if thou wilt trust Christ, thou shalt be saved from all thy sins in a moment, the whole of thy past life shall be blotted out." "Thirty years of sin shall be forgiven, and it shall not take thirty minutes to do it in. Fifty, sixty, seventy years shall all disappear as the morning's hoar-frost before the sun." "You may sin

all your life, and be saved at the last moment." If these promises were true, any man might commit the greatest crimes, and yet by a mere confession of faith secure eternal happiness!! To tempt men to be immoral is itself immoral.

The investor in such dubious transactions is so blinded by the dazzling expectation of the great reward offered that he entirely loses his usual cautiousness, and omits to properly examine the reliability of the guarantee. The most proper rule in such cases is for each man to take care of himself, and this is a moral duty both for his own sake and for that of society; the surest road to certainty is to fixedly believe only in verified truth. "If there were no fools there would be no rogues"; ignorant persons hanker after self-gratifying deceptions, like children do after forbidden enjoyments. It is much less selfish to work now, than to hope for something in the future without working for it; according to a Scotch proverb, "Hopers go to hell."

"He who acts through another does the thing himself," or is an accomplice in the act. Attractive promises excite irrational desires; and the existence of selfish desires tempts men to make unreliable promises to gratify them; the two conditions act and react upon each other so as to produce mutual increase, until a third condition is excited which opposes their further growth; thus the increase of gambling and the temptation to it becomes a public danger, until at last it excites criticism and public measures to restrain it.

The practice of gambling largely arises from selfish expectations. "The object of all gambling transactions is to win without the trouble of earning" (R. A. Proctor, "Familiar Science Studies," 1882, p. 252). Bazaars and lotteries in aid of charitable and other good objects encourage a spirit of gambling. There is no essential difference between the character of a theological lottery and that of an ordinary secular one; in each the promises are so largely wrapped up in mystery that only a few persons can perceive where the deception lies. "As a matter of fact, it remains true that these well-intentioned folk, often most devout and religious persons, do, in the pursuit of money for charitable purposes, pander to the selfishness and greed of the true gambler, and encourage the growth of similar evil qualities in the members of their own community."—"If charitable ends can at all justify immoral means, one might go farther still, and allow money to be obtained for such purposes from the encouragement of still more objectionable vices" (*ibid.*, p. 211). The prevailing feature of such guarantees is temptation to accept falsehood for the sake of personal gain, as in the offer of the tempter to Jesus Christ: "All these kingdoms will I give unto thee, if thou wilt fall down and worship me."

Similar to all other "evils," there is a degree of justification for false guarantees and pledges. In the widest scientific sense, "whatever is, is good"; deceitful promises are not essentially immoral, because all human actions are effects of natural energies acting through living beings; but in the ordinary sense, every human action which leads to avoidable "evil" is

disobedience of the moral rule to do the greatest good; the multitudes of actions entered in courts of law to settle such cases, testify to the general acceptance of this statement. Call such promises however what we may, moral or immoral, it is desirable to scientifically illustrate them as long as so many persons are unscientific. We must not forget that "promisers" as well as ignorant investors are, to a certain extent, a useful class of the community; without the promise of "a perfect cure" by some quack doctor, many persons are so negligent that they would not try any medical remedy; without the promise of an unreasonably high rate of interest, many men would not invest their money; and without the powerful stimulus of a promise of heaven and a fear of hell, many untrained persons would not mend their ways at all. In many cases, if there were no company promoters, or delusive prospectuses, there would be no speculating shareholders, and no money would be found for paying the expenses of large commercial experiments, in making docks, railways, etc., the benefits of which are subsequently reaped by the public at large whether the shareholders lose or gain. As many persons require to be enticed to do good, tempters are necessary. And with regard to blind promises and blind beliefs, whether commercial, medical, religious, or supernatural, a man who will not move until he is perfectly certain that what he is about to do will succeed, must "sit still and perish" (Locke). "Nothing venture, nothing have." Nearly every step in life is a choice between two evils, and all that we are able to do is to acquire all the available evidence, and guess as near as we can whether the "evil" effect is likely to be greater than the good one. Speculation in shares has been thus described:—

> "Some in clandestine companies combine;
> Create new stocks to trade beyond the line;
> With air and empty names beguile the town,
> And raise new credits first, then cry 'em down;
> Divide the empty nothing into shares,
> And set the crowd together by the ears."
>
> —*Defoe.*

Scientific experiments come to some extent under the same class as commercial speculations. If there were no original experiments, and no time occupied in evolving original thoughts, there would be no new knowledge obtained, none to be taught or be used in making inventions or in advancing civilisation. All these considerations bring us back to the scientific view of Nature, that whatever is must be, and that all apparent evil is universal good (see sections 37, 38). Scientific experiments, however, and the time speculatively expended upon them have usually a rational basis. Astronomers predict and promise the occurrence of numerous celestial phenomena, and the promises are almost invariably fulfilled. "Each year there is issued a thick octavo volume crowded with such predictions, three or four years in advance of the events predicted

and those predictions are accepted with as little doubt by astronomers as if they were the records of past events." "But astronomers are not only able to predict, they can also trace back the paths of the celestial bodies, and say: at such and such a long-past epoch a given star or planet occupied such and such a position upon the celestial sphere" (R. A. Proctor, "Light Science for Leisure Hours," 1871, p. 42); and on referring to the records of astronomical history this statement is found to be equally correct. In this way, science has made many thousands of promises, nearly all of which have been fulfilled. On the other hand, Jesus Christ said to his disciples:—"Verily, verily, there are some standing here who shall not taste of death until they see the Son of Man coming in his kingdom," but this prediction has never been fulfilled, all his hearers died soon after he said it, and his "Second Advent" has not occurred yet. Sectarians also have made numerous promises respecting extremely important events which never have happened or can happen, and they are still making others, without giving proper and sufficient evidence that they will ever be fulfilled. Similarly, some of the promises of the alchemists to their dupes in former times respecting scientific matters were nearly as untrustworthy, for instance, "the elixir of life," "the philosopher's stone," etc., and as alchemy was the necessary prelude to true chemistry, so is dogmatic theology a necessary prelude to true scientific religion. A large number of the practical realities and blessings of science we now enjoy were predicted in a greater or lesser degree beforehand by scientific men who saw what was coming; and we may anticipate that in the future, and before very long, when morality and religion have found a true basis in fundamental scientific principles, and have merged into science like alchemy merged into chemistry, the statements and promises of sectarians will become more truthful; at present nearly all men are like mere children in the subject of religion, and it is not much wonder that they get into a quagmire of ideas and words respecting it.

67. Seventh Rule—To Require Proper and Sufficient Evidence, etc.

That it is highly moral to require proper and sufficient evidence in support of all important statements; to proportion our belief to the strength of the evidence; and to doubt all unprovable statements, especially when they contradict natural truths, needs no arguments. Fixed belief without evidence in any serious subject is so repulsive and inconsistent with truthful ideas that very few really scientific men will have anything to do with it.

The rule—to proportion belief to the strength of the evidence is the chief basis of truthfulness, and largely also of wisdom. The degree of faith which we may properly have in a statement depends not only upon existing evidence, but also upon the degree of simplicity of the subject, and

the extent to which we understand it; we may morally believe anything for which there exists proper and sufficient evidence, and we may justifiably believe statements which we have not personally investigated, provided we know that they have been properly examined and proved.

Different subjects are not equally easy to understand; and those which are at present but little developed only future generations will be able fully to comprehend; there are some, however, in which, more so than in others, he who seeks the truth may find it. This is especially the case with the simpler sciences, such as astronomy, physics, and chemistry, and this is probably the reason why such immense progress and such great social advantages have already resulted from their investigation. The chief reasons why the beliefs we acquire in the subjects of physics and chemistry are much more certain than in others, are because they may be usually verified by any person at any time and in any place, and particularly because they may be checked and confirmed by means of experiment and observation in a variety of ways, and be thus found to support each other so as to form a consistent and systematic whole. In the physical sciences, pre-eminently, he who seeks the most certain truth may find it if he will only take sufficient trouble, whilst many of the disquisitions in theology are examples of cultured emptiness.

Unscientific persons frequently assert that certain unprovable things "may be true," and hold the most immovable and serious beliefs upon no better evidence, instead of entertaining them merely as hypotheses, and waiting for increase of knowledge to decide their truth or falsity. Such persons not unfrequently select for discussion the most abstruse or the most complex subjects, such as politics, sociology, and theology, and choose questions which, in the present state of knowledge, even the greatest intellects cannot decide, and affirm as settled truths fallacious solutions of problems, some of which require the most comprehensive knowledge. In discussing such subjects they often appear to possess more intelligence and mental ability than really profound and accurate thinkers, who honestly admit their inability to settle them. Often in this way erroneous assertion, dogma, and opinion are accepted as truth and as evidence of superior intelligence, whilst ability and honesty are interpreted as weakness by those who are incompetent to examine the evidence or to understand the circumstances. The complexity of Nature is, in many cases so great, as to hide the real future from our view by the very number of possibilities, and the most scientific persons can only attain to a moderate degree of certainty by much thought and labour. As the ability to obey the foregoing rule requires considerable preparatory training and intellectual ability, and the bulk of mankind have not the opportunity, they accept all beliefs that come readily to hand, with or without evidence, provided they appear to them reasonable, and this largely accounts for the extensive ready acceptance of untruthful ideas.

68. Eighth Rule—To Consider Consequences.

The moral rule to consider carefully beforehand the probable consequences of our acts is indispensable to wisdom and to success in life; we should so live that in old age we may have no remorse and but few regrets. Many persons never seem to consider that the bad consequences of their present neglect will fall upon themselves, their children, or others, sooner or later; a thriftless person for example, neglects the duties of carefulness and economy whilst young, and in old age suffers from want or becomes a burden upon his relatives or upon the ratepayers. Many human beings are much less provident than the lower animals, various of whom provide for the future; even the squirrel shows a lesson to man by his foresight in laying up a store of nuts for the winter; and the bees provide a stock of honey. Many parents, by neglecting to properly discipline their children, have disgrace brought upon themselves and others in later years by their children's wrong conduct; and many old persons can trace their failure in life to maternal neglect, producing conceit and neglect of learning whilst young, and resulting in their repenting too late. We are morally bound therefore to avoid doing that which will produce unnecessary pain to ourselves or to others in the future; and the future is often more important than the present, because it lasts longer.

Through neglect of obeying the above rule multitudes of serious accidents and "evil" consequences of all kinds continually occur, and their number is so great that a volume might be written respecting them; thus, liberal eating and drinking during the middle period of life produces a variety of incurable diseases in later years. Instead of acting upon the rule of thinking beforehand many persons act first and repent afterwards; they buy their experience too dearly. Accidents happen to all animals, and even to the most careful persons, because it often requires extensive knowledge as well as careful consideration to determine what will be the future consequences of our acts or of those of the world around us, and we often have not sufficient time to consider. Many persons are not aware that various substances take fire by the contact or presence of water, for instance, a damp hayrick spontaneously ignites; oily cotton-waste, ditto; boats laden with quicklime are not unfrequently burned through leakage of water into them, etc., etc. Natural powers and laws warn us to constantly "look ahead"; and punish us sooner or later if we do not; in the case of a vessel at sea, a "look-out" is always kept, and in crowded streets every driver and pedestrian has to be careful.

Prevention of evil is usually better than cure. "In the fevered race of modern civilisation men rush blindfold in the pursuit of pleasure or of gain, and are far more indebted for their security to those who will gently turn them aside from the pitfalls in their way than to those who, with whatever skill and care, do but raise them after they have fallen" (P.

Hood, M.D., "Treatise on Gout," 1879, p. 175). It is important to keep all our affairs straight as we go along, and not to postpone present duties, for "sufficient unto the day is the evil thereof"; the future will bring troubles to us as great as we can bear without adding others to them. We are not morally justified in neglecting to instruct our minds whilst we are young on the ground that the effects of our neglect are remote or may never occur; nor of trusting to ignorance and faith instead of to knowledge. We should avoid temptations of all kinds, both mental and physical; thus by placing our money in a savings bank we are less tempted to spend it; many a man and woman have become gradually afflicted with disease by yielding too readily to the attractions of "good living"; and many have become insane by yielding to unhealthy mental allurements. The conceited young person becomes the stupid and miserable old one.

69. Ninth Rule—To Properly Value all Things.

In nearly every step in life an alternative of two "evils" occurs, and then the most moral course is to "choose the least"; but we are often unable to reliably decide which is the least; "we do that which we ought not to do, and leave undone that which ought to be done"; we sacrifice the greater good to the smaller one, the future to the present, the welfare of many for the advantages of a few, or the greater personal interests of other men to smaller ones of our own, instead of the reverse, simply because we cannot properly assess their values. A condition of correct appraisement is a good judgment, and all men have either a good or a bad one, according as their intelligence and circumstances compel them. It is a matter of importance, therefore, to try to estimate all things according to their essential as well as their "practical" value, their present and their future effects, to view them in the widest scientific as well as in the ordinary narrow aspect; and Nature helps us considerably in the matter by showing us examples:—

> "He is the greatest artist, then,
> Whether of pencil or of pen,
> Who follows Nature. Never man,
> As artist or as artisan."
>
> —*Longfellow.*

In concrete subjects, such as those of geology and natural history, it is difficult to obtain accurate data upon which to base our judgment, and in the extremely complex subject of morals it is vastly more so, and it is not possible for any man or set of men to be "infallible"; in addition to this the elements of moral questions are often incapable of measurement, their values are liable to alter, and the final conclusion can only be guessed.

The difficulty of appraisement is increased by the circumstance that the term "value" has two very different meanings, viz., the extrinsic, or the

value to ourselves under particular circumstances; and intrinsic, the true value or importance in the universe under all conditions; and there may be a series of values ranging between these, according to the aspects in which we view it; the standards of value are often very numerous. The intrinsic value is essentially much more important than the extrinsic, because it is comprehensive and abiding, whilst the extrinsic is narrow and variable; but each is useful for its particular object, the former for scientific and the latter for ordinary purposes. The extrinsic importance of a thing is often a very complex question, because it frequently depends upon a number of trivial, indefinite, and variable circumstances, all of which have to be considered and allowed for; for instance, the value of a large diamond, or of a costly dress, depends upon the complex and variable standards of beauty, caprice, fashion, and other circumstances, and there is no one test alone by which we can accurately arrive at it. Even the intrinsic value of a thing, although it depends upon a less number of conditions, is usually not easily obtained, because it requires comprehensive knowledge and comparison; and is especially difficult in the subject of morals because of the great complexity of the questions.

We usually measure the importance of a thing in a very narrow manner, by how it affects us individually, or at the utmost by how it affects mankind; thus, according to Dr. Bentley, "the soul of one virtuous and religious man is of greater worth and excellence than the Sun and all his planets, and all the stars in the heavens" (quoted by R. A. Proctor, "Our Place among the Infinities," 1875, p. 57); but this great conclusion results from an extremely narrow view, because it ignores the facts that without this planet mankind could not exist, that multitudes of human beings are continually being sacrificed to omnipotent natural powers, that one man is only a 1200 millionth part of all mankind, that mankind is only a 100 million millionth part of the earth, that the earth is only an extremely minute portion of the solar system, and that system is only an infinitely minute fraction of "all the stars in the heavens."

The degree of essential importance of a substance or action may be viewed as being directly proportional to the magnitude of the good use it serves in the universe, and not merely by the amount of pleasure it confers upon a man or mankind. As everything, whether animate or inanimate, has to yield to the omnipotent energies of Nature, it is reasonable to conclude that those powers are amongst the most important of all things. In Nature we see that all bodies whatever obey the great energies of universal motion of mass and of molecules, gravitation, heat, light, electricity, magnetism, etc.; that all animals have to obey powers which are stronger than themselves, such as earthquakes, hurricanes, floods, etc.; that individual life is sacrificed to preserve life of the species, thus showing that the species are essentially more valuable than individuals; and even species are sacrificed and die out in obedience to the omnipotent inanimate powers which rule over everything. The superior importance or doing the greatest good rather than accumulating wealth, knowledge, of

other possessions, is shown by the general truth that Nature always punishes those who avoid doing good to others whilst trying only to benefit themselves. Nature indicates that truth is essentially more important than untruth or unprovable beliefs, and that knowledge is usually of more value than ignorance, because it is necessary for progress, whilst ignorance is necessary chiefly for retarding progress. We may often detect the most fundamental circumstance in a complex case by the fact that it is usually the one which is the most commonly present, thus, in a case of wrong conduct it is frequently ignorance.

We may also obtain some idea of the relative degrees of essential importance of things by observing their orders of evolution and of relative dependence of existence upon each other (see sections 13, 14); thus, of two mutually related ones, that which is the least dependent is usually the most important; thus time and space are the most important of all, because whilst they may exist without substances, the latter cannot exist without them, and this illustrates the fact, that that which is seen is often less universal than that which is unseen. Essential importance is largely proportionate to relative magnitude of power; thus the universe is of incalculably greater importance than mankind, and has immeasurably greater power over man than man has over it. The relative fundamental importance of bodies is essentially based upon natural power and law, or might combined with right; the weakest has often to yield; thus every animate and inanimate thing has to yield to the universal, omnipotent, and unceasing energy of universal molecular and molar motion, man has to wait on tide, on wind, and weather. Similarly in human life, the possession of social influence, political power, money, property, or knowledge, gives power and importance; the head of a nation, of an army, of a family, etc., is usually the most important person in it; but this power is liable to be overcome by combination of numbers.

Causes are often more essentially important than their effects, and prior phenomena than subsequent ones. It is generally considered that preservation of bodily existence is more important than cultivation of mind, because we must live first, and improve our minds afterwards. But, according to the Rev. F. W. Farrar, "there is something beyond the well-being of the body, far beyond the cultivation of the mind, it is the cultivation of the soul" ("Words of Truth and Wisdom," 2nd edition, p. 64). In this statement the mind and soul are spoken of as if they were different, but this has never been proved; also, as if the "soul" was of a far more exalted nature than the mind, but we possess no higher or more reliable faculty than the intellect; all the emotions, desires, and feelings are blind; in this statement also the fact is overlooked that whilst the body can exist without the soul, we possess no proper and sufficient evidence that the "soul" can exist without it. It is a contradiction to neglect the mind in order to cultivate the soul, because the mind is the soul. The proper measure of essential value of a human soul is probably the amount of good done by it, and, according to the almost unanimous verdict of

mankind, the value of that of an habitual murderer is less than nothing, and we certify this by sentencing him to death.

It is often a difficult matter in practical life even to approximately appraise human actions; nevertheless, it has frequently to be accomplished, and whilst in many cases numerous difficulties exist, in others the question and the circumstances are simple, and the proper decision is easily arrived at. Whilst it is comparatively easy to measure a great variety of physical quantities and conditions of human beings, such as their height, weight, strength, etc., it is extremely difficult to even approximately determine the magnitudes of value of their moral qualities. Very complex ideas often appear as important to us, for our moral guidance, as the very abstruse or comprehensive ones out of which they arise; for instance, those of character, virtue, honour, goodness, appear as humanly useful as the fundamental truths of science, although they arise out of and are dependent upon them.

In addition to the instances of relative value already mentioned, that which includes a thing is usually of greater importance than that which it includes; thus the interests of all mankind are of greater importance than those of a single nation, and those of a nation are usually larger than those of an individual, however able and good he may be; great truths are more valuable than the small ones they include; the preservation of life is more important than that of a limb; and so on. We further know that life, health, and happiness are each more valuable than riches; a good moral character is of more value than cleverness; "it is better to be good than great"; moral rules are more important essentially than conventional observances, thus Jesus said:—"Ye pay tithe of mint, cumin, and anise, and have omitted the weightier matters of the law, justice, mercy, and faith." Knowledge of a few great principles is more important than that of a multitude of small entertaining truths; a mere boy with a capacious memory may acquire the latter, but he can hardly possess the former; and many other examples. All such cases are, however, so much affected and qualified by degree and circumstance that definite rules cannot be framed for our guidance in them, and our judgments are largely left to be determined by the balance of natural influences upon us in each particular case.

In many cases where we have to decide between two objects or courses which is the best, in which the value of neither can be actually measured, or where the two cannot be referred to the same standard of measurement, we have largely to guess their relative value. It continually happens to juries to have to make such appraisements; for instance, they have sometimes to decide how much pecuniary damages should be awarded as an equivalent for wounded feelings in a case of breach of promise of marriage, notwithstanding that money and wounded feelings are incommensurable.

The phenomena of Nature may be viewed as a series or hierarchy of various degrees of essential importance of different things, in which those

of lesser value are sacrificed to, or have to obey, those of greater (see section 14); thus the movements of the earth must obey those of the sun; those of the moon are governed by those of the earth; everything upon the earth must yield to its motion and be carried through space with it; conversely, those of the earth are effected by those of the moon; and those of the sun by those of the earth, etc. The involuntary organs of animals, being more essential to life than the voluntary ones, are treated by Nature as being of more importance, and are placed in the more protected places within the body; thus arteries are usually more protected than veins. As the powers of Nature treat things, so to a large extent must men; we may largely accept the actions of Nature as a guide:—first, because they exclude the misleading influence of human bias, prejudice, and feeling; and second, because they do not include the errors due to the feebleness of our intellect when examining difficult questions; the powers and laws of Nature sum up the values of all things for us. That Nature does really sum up all things and settle questions for us on the very greatest scale, including a vast variety of the most complex problems, and show us a balance in favour of human improvement, is proved by the great fact of progress; if there was no such balance there would be no advance in civilisation.

It is a common circumstance that the more important a thing appears when considered in the ordinary or narrow sense the less important is it in a comprehensive one, thus, according to St. G. Mivart, "the first and most fundamental of all facts is the fact of our continuous being"; "the fact of self-existence from day to day is the most fundamental and important of all facts our minds can give us any information about" ("The Groundwork of Science," 1898, p. 233). This is quite true according to our usual mode of estimating things, but not according to the most fundamental one, because the fact of the existence of the universe is comparably more important than that of any single individual can possibly be. Whether we regard either the material substance or the energy of a single person it is only an invisible point in comparison with that of the universe; nevertheless, each man largely acts as if he was "the hub of the universe." Individual men, like all other living things, also differ in their degree of essential importance; thus a wise man is usually more valuable than an ignorant one.

The most valuable human possessions are usually life, health, character, happiness; and next to these, the means of maintaining them—viz., moral conduct, knowledge, and money. Life must be maintained, and knowledge is indispensably necessary to physical existence. "Skin for skin, yea, all that a man hath will he give for his life" (Job, chapter ii). In cases of serious illness a man will give all the money he possesses in exchange for such knowledge as will save his life; and it is a well-established fact that nearly all persons die at an earlier age than they otherwise would in consequence of not knowing how to preserve their health. Knowledge is even more indispensable to our existence than money; we could not safely perform a single act unless we knew beforehand that it would not injure

ourselves or others; but next to health, happiness, good character, and knowledge, money is usually of the greatest value, because it may be used as a powerful means of doing good in a great variety of ways.

It is worthy of notice how very unequally different persons value the same thing; each one usually esteems an article in direct proportion to his knowledge of its uses. Most persons value articles and circumstances according to their extrinsic rather than to their intrinsic importance, thus they estimate it by the sum of money it would sell for, rather than by its useful powers; they often measure each other's importance more by their external appearances than by their intrinsic qualities; more by their display and popularity than by their moral and intellectual worth; they value diamonds more than iron, notwithstanding that the properties of iron are by far the most important. A new fashion in dress is far more generally appreciated than an important discovery in science, because it is more easily understood. "Collectors of coins, dresses, and butterflies have astonished the world with eulogiums which would raise their particular studies into the first ranks of philosophy" (I. Disraeli, "Miscellanies of Literature," 1840, p. 6). We are apt to over-estimate the importance of everything which affects us personally, thus many a person has lost his sanity by over-valuing "salvation"; similar remarks might be multiplied indefinitely. When a man thinks that he is going to perform a very clever act he is usually going to do a very foolish one, because his excitement about it overpowers his judgment; he over-values his object, and under-values other circumstances.

The less we perceive or understand a thing the less importance we usually attach to it, because it has made a feebler mental impression upon us. "What the eye does not see the heart does not grieve after," however great it may be. All men are apt to underrate the abilities of those whom they do not know; thus Englishmen and foreigners often under-estimate each other's strength and ability. We value things usually not by their reality, but by what we with our extremely limited faculties happen to perceive; for instance, we attach great importance to the physical evils of over-drinking largely because they happen to be conspicuous, but think less about the greater ones of over-eating because they are slower in appearing and require more intelligence to appraise them.

We are apt to over-estimate the value of tangible and visible things and under-estimate that of intangible and invisible ones; thus we especially value a small immediate benefit more than a large and remote one, even when both are equally certain. The most important sources of our welfare and happiness are often the least easily perceived ones, and the things most necessary to our existence are in many cases the last we perceive or discover; thus, whilst gold has been known an immense period of time, oxygen, the great sustainer of life, has only been discovered about two hundred years, and the universal ether, which is even more indispensable, a still smaller period; but if oxygen had been a solid, and of a brilliant colour, it would have been discovered thousands of years ago. The quiet

social energies of mankind have greater importance than wars or revolutions; and it is often the internal and invisible principles of a man, not his external and visible experiences, which are really the most important.

All persons undervalue that which they obtain too easily, because they have not experienced the loss and labour of producing it, for instance, the advantages they have inherited; the reason why we usually value that most which has cost us most labour to obtain is because the greater sacrifice has made a stronger impression upon us; thus greater value is usually attributed to knowledge by an intelligent man than by an ignorant one; to money by a provident man than by an improvident one. It is a necessary consequence of the natural action of consciousness that we usually under-estimate the value of knowledge we do not possess in comparison with that which we do possess; for a similar reason each man is liable to undervalue the knowledge and ability of other men, because he has not had their experience.

Nearly all those persons who are termed "cranks" and "enthusiasts" overvalue the importance of their own special object, and undervalue its opposite; and this is usually a sign of narrow judgment. According to the law of causation, however, all men do as they must; the world is better ordered than we could have arranged it, largely because we are apt to omit consideration of the necessity of imperfection and conflict to the best rate of progress; in this way the spontaneous actions of men often agree with the most comprehensive scientific views. Most persons think that energy and enthusiasm are more valuable than understanding, but it depends largely upon the circumstances; usually wise direction is more important than strength, because we can often obtain animals and engines to do the physical labour. If there were no enthusiasts who overvalued their own subjects many good objects would not be carried out, and any system of morality which does not recognise this fact must be incomplete; we must also not forget that animal energy underlies all intellect and progress.

It is largely in consequence of the almost universal desire of men for some immediate advantage which they can understand, that any and every kind of scientific occupation is more valued than the discovery of new knowledge; accounts of inventions and technical investigations are accepted and published as if they were of greater value than the discoveries upon which they are based; and measurements of known phenomena are treated as if they were of more importance than the discoveries of the phenomena themselves, and the readiness of acceptance and publication of a new truth is often inversely proportional to its degree of intrinsic importance (see *Chemical News*, vol. lxxvi, July 22, 1892, p. 39). Whilst it is an advantage to recognise this fact, it is vain to expect an early remedy, because the defect lies deep in the nature of men and of things; the importance of difficult experimental researches cannot be examined and determined off-hand; each scientific man also has his own work to do,

and has not the time to properly test the results of another man's labour. Human life is too full of occupation to properly examine and value at once abstruse discoveries or philosophies which are in advance of the time, and which require special knowledge and experience, and a large amount of time and money to test them; life is too short to enable men in general to spend much time upon anything, except maintaining their existence and that of a family, and mankind have to be satisfied with very superficial examination of nearly all things; in this way they are led to undervalue almost everything abstruse, for instance, the degree of intrinsic importance of the universal ether, universal radiation, temperature, and of many other subjects. It is only reasonable to expect that the more abstruse and complex a truth is, the longer time it requires to filter into the minds of men. With regard even to the subject of the relation of science to morality there is probably scarcely a single English review which would publish an article on it if the article went to the real basis of the matter. Even by scientific men truth is not always valued according to its degree of real importance; there always exist in scientific periodicals, and the publications of scientific societies, a large number of published original and costly researches made by comparatively unobtrusive investigators, of which little or no notice is taken during many years, whilst other researches, often of much less real value, but more attractive or ostentatious, receive greater notice. In the far distant future, when men have become more intelligent, and less time will be required to obtain a livelihood, they will be much better able to appraise things.

70. Tenth Rule—To Acquire Wisdom.

The powers of prediction of consequences and of reliable appraisement of conduct, constitute the chief basis of wisdom and judgment. "To prize everything according to its real use ought to be the aim of a rational being. There are few things which so much conduce to happiness, and therefore few things to be so ardently desired." "Happy is the man that findeth wisdom and getteth understanding. She is more precious than rubies, and all the things that thou canst desire are not to be compared unto her. Length of days is in her right hand, and in her left hand riches and honour. Her ways are ways of pleasantness, and all her paths are peace." A man cannot be a thorough lover of truth without a proper valuation of himself, and therefore not without knowing the numerous limitations of human powers, nor without acquiring humility.

Wisdom and good judgment are results of extensive and varied knowledge, well-developed intellect, and well-regulated feeling; and as they constitute the most perfect intellectual and moral condition, they can only be gradually acquired. "We cannot put old heads upon young shoulders"; it takes the whole of a man's life to become even moderately wise. "Wisdom is the principal thing; therefore get wisdom; and with all thy getting

get understanding" (Proverbs iv, verse 7). Some persons appear wise whose heads are only filled with proverbs and texts, a collection of fragments, the products of wisdom, not wisdom itself, which consists of great truths and principles applicable to an endless variety of cases. Wisdom is the chief guide of life, and its warnings are predictions, telling us before events occur what will happen; it is also the practical application in human conduct of the great principles of science, under the guidance of reason; but—

> "Knowledge and wisdom, far from being one,
> Have oft-times no connection. Knowledge dwells
> In heads replete with thoughts of other men;
> Wisdom in minds attentive to their own."
>
> —*Cowper.*

Hesiod said, "best of all is he who is wise by his own wit; next best he who is wise by the wit of others; but whoso is neither able to see nor willing to hear, he is a good-for-nothing fellow" (Cardinal Newman, "A Grammar of Assent," 1870, p. 335). Wisdom is a commanding virtue, the most comprehensive attainment, the synonym of universal goodness; altruism could not largely exist without it. A chief condition of wisdom is comprehensive knowledge of Nature:—"Never, no, never, did Nature say one thing and wisdom say another" (E. Burke), but this is true only of the great principles of Nature, not of narrow ideas of Nature. The wisdom of ages becomes the common thought of sages. "Only the wise are fit to govern, and they are few" (Socrates). "The great must submit to the dominion of prudence and of virtue, or none will long submit to the dominion of the great" (E. Burke). "What is liberty without wisdom and without virtue? It is the greatest of all possible evils; for it is folly, vice, and madness, without tuition or restraint" (*ibid.*). Men who are weak in wisdom are often strong in prejudice; strong for evil, feeble for good. "There is a courageous wisdom; there is also a false, reptile prudence, the result, not of caution, but of fear" (*ibid.*). "A wise man knows his own want of wisdom." Nothing preserves mental health so effectually as wisdom. All wise actions are determined by reason; it is an unwise or ill-balanced mind which most often becomes insane, one which over-estimates little things, and undervalues great ones; "A large genius is plainly not in the least akin to madness" (Maudsley, "Pathology of Mind,' 1879, p. 303).

Wisdom is the best use of knowledge; it is more comprehensive than knowledge, because it is a summing-up of the real values of all information relating to the particular case, and it often results in avoidance of extremes. Practical wisdom is an effect of complete obedience to moral rules founded upon great natural truths, and its effects are peace, holiness, and happiness. Complacency, cheerfulness, a philosophic spirit, and devout worship of truth are often signs of wisdom. As wisdom is more valuable than knowledge, and depends upon it, so also is a perfectly moral and religious character more important than intelligence, but cannot be acquired

without it. Even the most perfect wisdom and goodness is dependent upon and impelled by the so-called "lower" faculties of animal feeling, emotion, desire, and the influences of environment and intellect, and not upon any higher human capacities, because we do not possess any; or, if we do, their existence remains to be proved.

Infinite wisdom and unlimited truth are largely synonymous with each other and are consistent with the idea of omnipotent, omnipresent, infinite, and eternal causation; and the wisdom typified by the arrangement and working of the universe is the most comprehensive example of goodness. The most valuable effect of wisdom is goodness; goodness or virtue consists in doing the greatest good to all men, one's self included. The most independent and fearless man is he who has sufficiency of virtue, wisdom, knowledge, and money. In consequence of our extremely finite capacities, whilst we may have greed for knowledge and especially for money, for more than we can perfectly use, we cannot possess too much wisdom or goodness; the two differ in this respect from all other possessions; and herein lies infinite scope for virtuous ambition, and the attainment of a true heaven upon earth. As the scope for goodness is smaller the less intelligent the creed, ordinary "religion" and dogma does not usually produce the purest goodness.

If the chief statements respecting the relations of science to conduct, so often reiterated in this book, are true, they necessarily lead to a scientific religion, in the form of a practical worship of truth in all its devotional aspects of omnipotence, universality, immutability, and endless duration; and of its inseparable attributes of infinite wisdom, justice, majesty, beneficence, and mercy (see p. 34); and to the gradual extinction of untruthful and unprovable dogmas and beliefs, and of the practices founded upon them. The chief or only difference between ordinary and scientific religion is that the latter consists of the former purged of all its unprovable ideas, and is of a much more comprehensive nature.

Summary of General Conclusions.

The entire evidence contained in this book appears to be consistent with the following conclusions:—(1) that the whole of Nature is a perfect system of energy, acting in accordance with immutable laws; (2) that if this statement be correct the system must also be one of perfect order and truth; (3) that if the universe is a perfect system of truth, all statements which are inconsistent with natural truth are errors, and tend to produce untruthfulness, accident, and crime; (4) that if it is a perfect system of law, order, and truth, it must be free from all real evil, but in consequence of our sufferings, and of the extreme feebleness of our powers in comparison with the greatness and complexity of the universe, Nature is considered by nearly all men to be permeated by "evil"; (5) that which we usually term "evil" is, however, simply pain to human beings, and they

constitute only about one 100 million millionth part of this globe; (6) that the pain and "evil" we suffer are necessary conditions of pleasure and progress, and prevent a far greater amount of pain and "evil" which we otherwise would have to bear; (7) that as the energies of the universe are infinitely great in comparison with those of mankind, human actions are nearly wholly caused by them, and man can in only a very minute degree react upon and determine the actions of Nature; (8) that as a body cannot directly act upon itself, man's great source of improvement lies in placing himself in such conditions and circumstances that they may suitably act upon and improve him; (9) that as the actions of man are determined by omnipotent and unceasing energy operating through his organism and environments, his physical, moral, and religious conduct has a scientific basis, and a scientific system of morality and religion is possible; and (10) that scientific religion consists in worshipping truth in all its greatest or devotional aspects of omnipotence, omnipresence, immutability, infinity, and universal goodness, and in practising obedience to all the rules of morality. As a matter of course, if the first of the above conclusions is untrue all those dependent upon it are invalid.

> "Great is the art of beginning, but greater the art is of ending;
> Many a poem is marred by a superfluous verse."
>
> —*Longfellow.*

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